Series 1939, No. 2 Issued June 1944

Soil Survey

Vanderburgh County Indiana

By

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United States Department of Agriculture

and

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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils, and
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In cooperation with the
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BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

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SOIL SURVEY OF VANDERBURGH COUNTY, INDIANA

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CONTENTS

HOW TO USE THE SOIL SURVEY MAP AND REPORT

The soil survey map and report of Vanderburgh County, Ind., contain information—both general and specific—about the soils, crops, and agriculture of the county. They are prepared for the general public and are designed to meet the needs of a wide variety of readers. The individual reader may be interested in some particular part of the report or in all of it. Ordinarily, he will not have to read the whole report to gain the information he needs.

Readers of soil survey reports may be considered to belong to three general groups: (1) Those interested in limited areas, such as communities, farms, and fields; (2) those interested in the county as a whole; and (3) students and teachers of soil science and related agricultural sciences. An attempt has been made to satisfy the needs of these three groups by making the report a comprehensive reference work on the soils and their relation to crops and agriculture.

Those readers whose chief interest is in limited areas, such as some particular locality, farm, or field, include the farmers, agricultural technicians interested in planning operations in communities or on individual farms and real estate agents, land appraisers, prospective purchasers and tenants, and farm-loan agencies. The first step of a reader in this group is to locate on the map the tract with which he is concerned. The second step is to identify the soils on the tract. This is done by locating in the legend on the margin of the map the symbols and colors that represent the soils in the area. The third is to locate the name of each soil in the Contents, which refers the reader to the page or pages in the section on Soils where each soil is discussed in detail. Under the soil-type heading he will find a description of the soil and information as to its suitability for use and its relationship

to crops and agriculture. He also will find useful information in the sections on Productivity Ratings and Physical Land Classification, Land Use and Soil Management, and Water Control on the Land.

The second group includes persons interested in the county as a whole, such as those concerned with land use planning, the placement and development of highways, power lines, docks, urban sites, industries, community cooperatives, resettlement projects, private or public forest areas, recreational areas, and wildlife projects. The following sections are intended for such users: (1) County Surveyed, in which such topics as physiography, vegetation, water supply, population, and cultural developments are discussed; (2) Agriculture, in which a brief history of the agriculture of the area is given and the present agriculture is described; (3) Productivity Ratings and Physical Land Classification, in which the productivity of the soils is given, a grouping of soils according to their relative physical suitability for agricultural use is presented, and a generalized land map is included; (4) Land Use and Soil Management, in which the present use and management of the soils are described, their management requirements are discussed, and suggestions for improvement in management are made; and (5) Water Control on the Land, in which the problems pertaining to drainage and control of runoff, including control of accelerated erosion, are treated.

The third group of readers includes students and teachers of soil science and allied subjects, such as crops, forestry, animal husbandry, economics, rural sociology, geography, and geology. The teacher or student of soils will find the section on Morphology and Genesis of Soils of special interest. He will also find useful information in the section on Soils, the first part of which represents the general scheme of classification and a discussion of the soils from the point of view of the county as a whole, and the second part of which presents a detailed discussion of each soil. If he is not already familiar with the classification and mapping of soils, he will find that discussed in Soil Survey Methods and Definitions. The teachers of other subjects will find the sections County Surveyed, Agriculture, and Productivity Ratings and Physical Land Classification, and the first part of the section on Soils of particular value in determining the relationships between their special subjects and the soils in the county. Soil scientists or students of soils as such will find their special interest in the section on Morphology and Genesis of Soils.

COUNTY SURVEYED

LOCATION AND EXTENT

Vanderburgh County is in the southwestern part of Indiana (fig. 1). It is rectangular in shape, except for the irregularity of the southern boundary formed by the Ohio River. The maximum distance from north to south is about 23 miles, and the maximum distance from east to west is about 13 miles. Evansville, the county seat, is 145 miles southwest of Indianapolis, 250 miles southwest of Fort Wayne, 105 miles south of Terre Haute, 292 miles south of Chicago, Ill., 127 miles southwest of Louisville, Ky., and 158 miles north of Nashville, Tenn. The total area of the county is 233 square miles, or 149,120 acres. In

addition, about 4 square miles of Henderson County, Ky., are shown on the soil map, because of a recent shift in the bed of the Ohio River. The old river bed is the legal State boundary.

PHYSIOGRAPHY AND DRAINAGE

Vanderburgh County lies entirely within the physiographic subdivision known as the Wabash lowland. The area is characterized by extensive areas of alluvial and lacustrine deposits. The rocks of the Wabash lowland offer little resistance to denudation agencies. This fact partly explains the generally low altitude of the area—an average of about 500 feet above sea level. Every stream of considerable size runs in a flat wide valley (*8*).[1]

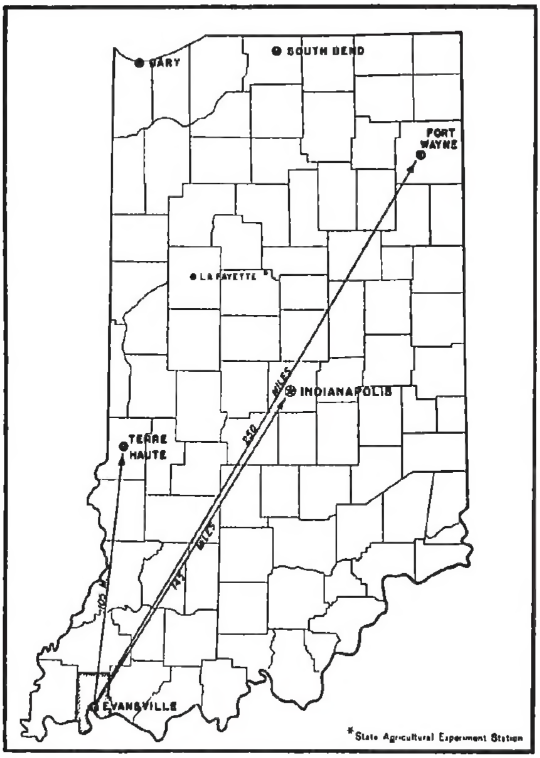

FIGURE 1.—Location of Vanderburgh County in Indiana. (Mileage shown is in air miles.)

The main features of the Wabash lowland are the filled-in or aggraded valleys and the presence of bedrock hills or monadnocks, which stand like islands in the midst of alluvium. The tops of the highest ridges in the western part of the county rise to an elevation of 600 feet. These are thought by Fuller and Clapp (*6*) to be remnants of a peneplain of the Tertiary age. In the northern and eastern parts of the county the flat ridge tops and the divides rise to an elevation of about 500 feet. Logan and his associates (*8*) state that these represent a second peneplain, probably of the Pleistocene period.

The county may be divided into the following topographic divisions: (1) Hilly uplands, (2) rolling uplands, (3) upland plains, and (4) river flats.

The hilly uplands are developed between Flat Creek on the north and the valley of Pigeon Creek on the south. This section is characterized by long narrow ridges, from 2 to 7 miles in length with only a slight change in elevation. The hillsides slope sharply into

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[1] Italic numbers in parentheses refer to Literature Cited, p 148.

narrow V-shaped valleys. Stream dissection is thorough. The numerous small intermittent streams are separated from one another by sharp divides. The small streams flow swiftly and cut rapidly near the headwaters where the bottoms are narrow. Erosion has been rapid and severe, resulting in much filling of the flood plains.

The rolling-upland division comprises areas of gentler relief. It includes the northern and eastern parts of the county. The hills are smaller and more rounded than those of the hilly uplands. The altitude of these hills in few places exceeds 550 feet. The gradient of streams is not as great, the valleys are broader, and the small intermittent streams, separated from one another by broad, nearly flat divides, have valleys that are more curving in cross section than those of the hilly section to the south and west. Erosion has been active, but not to the degree it has been in the hilly uplands.

The upland plains consist of broad, flat, or undulating surfaces at an elevation of about 500 feet above sea level. They are composed of deposits probably accumulated in lakes during the time of the Illinoian ice invasion. This section is in the northwestern part of the county in the vicinity of Flat Creek. The deposits along Flat Creek are old lacustrine sediments. These were laid down as stratified clays, sands, and gravel issuing from the ice sheet into a lake, known as glacial Lake Patoka, which then existed in this region. Glacial Lake Patoka was mostly in what is now Dubois and Pike Counties, and other similar but smaller lakes, including part of what is now Vanderburgh County, were distributed along the edge of the Illinoian ice sheet (*8*). Over all of this area is a deposit of fine silt, which appears to be loess.

The river flats are filled or aggraded valleys. All the major streams and many of the minor ones flow through broad flat plains of silty deposits. These flood plains are generally overflowed in spring. Continued filling is going on in all of the stream valleys due to accelerated erosion of the uplands. This condition is more readily observed in the narrow valleys of the small streams where the new deposits are similar to the materials of the adjacent uplands.

The glacial boundary or limit of the Illinoian drift is shown by geologists to cut across the northwestern part of the county (*7*), but glacial till was not observed in this section at the time the survey was made. The uplands, according to the geologists, carry only scanty glacial material and are capped by moderately thick loess; whereas the valleys contain thick silt deposits, which are attributed to turbid discharges from the ice sheet that accumulated in the glacial lakes. Subsequent to this silt filling, calcareous material was laid down by an ice sheet (*7*). Over the calcareous deposits in these valleys is another mantle of silt, which presumably is loess as the adjacent uplands are capped with loess.

The geological formations underlying the rugged and rolling uplands belong to the Pennsylvanian series and are of the Carboniferous age. The formations arranged in order of increasing age of the rocks are as follows: The Wabash, Inglefield, Ditney, Somerville, and Millersburg (*6*).[2]

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[2] The Inglefield sandstone is supposed to be the equivalent of Merom sandstone, the Ditney and Petersburg are now classed as part of the Shelburn formation, and the Millersburg coal is now assigned to the upper part of the Petersburg formation. The remainder of the Millersburg comprises the lower part of the Shelburn formation (*14*).

Most of the waters of Vanderburgh County find their way into the Ohio River. In the northern and western parts of the county the area is drained by Flat Creek, Barr Creek, and South Fork of Big Creek. These are all tributaries of Big Creek, which discharges its water into the Wabash River and thence into the Ohio. The eastern and central parts of the county are drained by Little Pigeon, Bluegrass, and Locust Creeks, which flow into Pigeon Creek. Pigeon Creek empties into the Ohio River at the west end of Evansville. Bayou Creek has a small drainage basin in the southwestern part of the county and flows directly into the Ohio River near the Posey-Vanderburgh County line. In the northwestern part of the county drainage is in a westerly or northwesterly direction. Flat Creek and Barr Creek flow across an old lake plain. These streams have a low gradient, causing the flow to be slow. Natural drainage in large areas near the headwaters of these streams is poor. Many ditches and channels have been dug in this lake plain in order to drain it adequately. The South Fork of Big Creek flows southwestward. Stream dissection of this drainage basin is complete, but the relief is not so pronounced as that of the areas to the south or east of this vicinity. The hillsides slope gradually to steeply to the valley floor. The flow of Little Pigeon, Locust, and Bluegrass Creeks is chiefly in a southerly direction. The drainage basins of Little Pigeon, Locust, and the headwaters of Bluegrass Creeks are thoroughly dissected. Most of the slopes break sharply and steeply to the stream bottoms. The land at Kasson and southwest of Kasson is drained by Bayou Creek, and the slopes break very steeply to the narrow stream bottoms. These bottoms widen out as they approach the main stream.

According to Logan et al. (*8*), the maximum altitude is 600 feet above sea level, the minimum is 321 feet, and the average is 430 feet; the maximum difference in elevation, therefore, is 279 feet, although the maximum local difference is 140 feet. The highest knob with an elevation of 600 feet is about 1½ miles northeast of St. Joseph. The second highest knob, with an elevation of 580 feet, is in the extreme northeastern part of the county. Elevations of other places [3] are as follows: Armstrong, 431 feet; Martin, 431 feet; Zipp, 460 feet; McCutchanville, 500 feet; Inglefield, 470 feet; St. Wendells in Posey County, 460 feet; and Evansville, 394 feet.

WATER SUPPLIES

Water for drinking purposes on the farms is obtained from deep wells and rain-water cisterns. Evansville obtains its water supply from the Ohio River.

The numerous small streams throughout the county cannot be depended on as a year-round source of water for livestock, because these streams go dry each summer. In wet years Pigeon Creek, Big Creek, and Flat Creek maintain a weak flow throughout most of the summer, but in dry years the water in these streams is reduced to a series of disconnected ponds.

A number of artificial lakes have been built within the county by governmental and private agencies by the damming of small

[3] Elevations obtained from United States Geological Survey topographic maps.

streams. One such lake is near McCutchanville. Lake Susanna is in the extreme southwestern part of the county. Numerous small private lakes are used for recreational purposes. Municipal swimming pools are placed at strategic places throughout the city of Evansville in order to be accessible to the greatest number of individuals. A municipal park in a natural setting is being developed at Burdette Park in the southwestern part of the county. Swimming, boating, picnicking, and other entertainments are available.

VEGETATION

Vanderburgh County is located in the southern part of the central hardwood belt.[4] Originally the soils of the county supported a luxuriant growth of timber, but only a few small stands of virgin timber remain and most of these stands are on the steeper slopes. At one time income from the sale of timber was important for many operators, who sold their products in Evansville, a furniture-manufacturing center. In recent years the furniture-manufacturing industry has almost ceased, no doubt owing largely to the difficulty of obtaining choice lumber.

At present the forests (*2*) consist of patches of woodland that are composed chiefly of second-growth trees less than 12 inches in diameter and that are distributed throughout the county, most commonly in the hilly sections. Most of the wooded areas have been untouched because they are too steep and too highly dissected by small streams and draws for cultivation and because the soils are shallow. A great many of these areas are grazed by cattle, hogs, or sheep; some are used for recreation, as picnic grounds and parks; others serve as protection to small wildlife; and a few large tracts have been posted as classified forests. The aerial views, presented in plates 5 and 6 (see pp. 96 and 97), show the relative extent and position of the forests of a typical area.

Most of these wooded areas are on steep well-drained land that is not suited for cultivation; consequently, the Vanderburgh soils have a larger total acreage in woodland than any other soil in the county. However, wooded areas also occur along streams and bottom lands, some of which are very poorly drained, and on the Ohio River bottoms the trees occupy sloughs, which consist of the Melvin soils. There is also much other land, too steep or too eroded for cultivation, which should be in forest. Sassafras, black locust, and sumac are among the first trees to make their appearance on abandoned land, and these are followed by various oaks.

It is not likely that the income from forest products will be large on many farms for some years to come because it takes many years to produce merchantable trees. However, from the standpoint of soil conservation and wildlife protection, it is important that forests be maintained and protected from intensive grazing and fires. Fire destruction in this area has not been serious in the past.

The following species of trees can be found in the habitats indicated.

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[4] SILCOX, F. A. FOREST REGIONS OF THE UNITED STATES. U. S. Dept. Agr. Forest Serv. 1938. [Map.]

Well-drained soils (Vanderburgh, Zanesville, Alford, Hosmer, Memphis, Iona, Tilsit, Wheeling, Sciotoville, and Markland):

Quercus maxima (Marsh) Ashe	Eastern red oak.
Quercus alba L.	White oak
Quercus falcata Michx	Southern red oak (Spanish oak).
Quercus velutina Lam	Black oak.
Carya laciniosa (Michx f.) Loud	Shellbark hickory.
Robinia pseudoacacia L	Black locust.
Gleditsia triacanthos L	Honeylocust.
Ailanthus altissima (Mill.) Swingle	Ailanthus (tree of heaven).
Sassafras albidum (Nutt.) Nees	Sassafras.
Cornus florida L	Flowering dogwood.
Morus rubra L	Red mulberry.
Fraximus americana L	White ash.
Cercis canadensis L	Redbud
Ostrya virginiana (Mill.) K. Koch	Ironwood.
Diospyros virginiana L	Persimmon.
Liriodendron tulipifera L	Tuliptree.
Acer saccharophorum K. Koch	Sugar maple.
Acer nigrum Michx. f	Black maple.
Juglans nigra L	Black walnut.
Juglans cinerea L	Butternut.
Tilia heterophylla Vent	White basswood.
Fagus grandifolia Ehrh	American beech.
Nyssa sylvatica Marsh	Black tupelo (blackgum).

Imperfectly drained soils of the uplands (Ayrshire, Johnsburg, McGary, Weinbach, Zipp, Montgomery, Ragsdale, Woodmere, and Rahm):

Quercus velutina Lam	Black oak.
Quercus falcata Michx	Southern red oak (Spanish oak).
Quercus Marilandica Muenchh	Blackjack oak.
Quercus stellata Wangh	Post oak.
Quercus Bicolor Willd	Swamp white oak.
Quercus Palustris Muenchh	Pin oak.
Catalpa Speciosa Warder	Persimmon.
Sassafras albidum (Nutt.) Nees	Sassafras.
Carya Cordiformis (Wangh.) K. Koch	Pignut hickory.
Liquidambar styraciflua L	Sweetgum.
Ulmus alata Michx	Winged elm.
Cercis canadensis L	Redbud.
Carya laciniosa (Michx. f.) Loud	Shellbark hickory.
Fraximus americana L	White ash.

Well-drained and imperfectly drained soils derived from stream silts and local alluvial deposits (Stendal, Philo, Inglefield, Adler, Algiers, Lyles, Keyesport, Huntington, and Lindside):

Carpinus caroliniana Walt	Blue beech (water beech).
Liriodendron tulipifera L	Tuliptree.
Acer saccharinum L	Silver maple.
Carya laciniosa (Michx. f.) Loud	Shellbark hickory.
Quercus Macrocarpa Michx	Bur oak.
Quercus maxima (Marsh.) Ashe	Eastern red oak
Ulmus americana L	White elm.
Sassafras albidum (Nutt.) Nees	Sassafras.
Liquidambar styraciflua L	Sweetgum.
Morus rubra L	Red mulberry.
Fraxinus americana L	White ash.
Platanus occidentalis L	Sycamore.
Cercis canadensis L	Redbud.
Celtis laevigata Willd	Sugarberry.
Celtis occidentalis L	Hackberry.

Populus deltoides Marsh	Cottonwood.
Maclura pomifera (Raf.) Schneid	Osageorange.
Catalpa Speciosa Warder	Catalpa.
Gleditsia triacanthos L	Honeylocust.
Gymnocladus dioicus (L.) K. Koch	Coffeetree.
Ptelea trifoliata L	Hoptree or shrubby trefoil.
Acer negundo L	Boxelder.

Poorly drained soils (Peoga, Waverly, Melvin, and Ginat):

Salix nigra Marsh	Ward willow.
Acer Rubrum L	Red maple.
Acer saccharinum L	Silver maple.
Populus heterophylla L	Swamp cottonwood.
Alnus rugosa (Du Roi) Spreng	Alder.
Quercus lyrata Walt	Overcup oak.
Quercus prinus L	Swamp chestnut (cow) oak.
Quercus imbricaria Michx	Shingle oak.
Quercus Palustris Muenchh	Pin oak.
Quercus Bicolor Willd	Swamp white oak.
Carpinus caroliniana Walt	Blue beech (water beech).
Acer negundo L	Boxelder.
Fraxinus tomentosa Michx. f	Pumpkin ash.
Populus deltoides Marsh	Cottonwood.
Betula nigra L	Red birch.

River bottoms and swampy areas (Lindside, Huntington, and Melvin):

Taxodium distichum L. Rich	Baldcypress.
Carya pecan (Marsh.) Engl. & Graebn	Pecan.

The following species of shrubs and grasses (*4*) can be found in the habitats indicated.[5]

Wet habitats along stream bottoms, ponds, and sloughs:

Shrubs

Ampelopsis cordata Michx	Heartleaf ampelopsis.
Aristolochia tomentosa Sims	Woolly pipe-vine.
Cephalanthus occidentalis L	Common buttonbush.
Cornus stricta Lam	Stiff dogwood.
Lindera benzoin (L.) Bl	Spicebush.
Salix discolor Muhl	Pussy willow.
Salix interior Rowlee	Longleaf willow.
Salix sericea Marsh	Silky willow.
Salix longipes var. (Bebb) Schneid	Ward willow.

Grasses

Agrostis hiemalis (Walt.) BSP	Ticklegrass.
Arundinaria gigantea (Walt.) Chapm	Southern cane.
Cinna arundinacea L	Stout woodreed.
Eragrostis hypnoides (Lam.) BSP	Moss lovegrass or creeping eragrostis.
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass or pursh lovegrass.
Glyceria striata (Lam.) Hitchc	Fowl mannagrass.
Leersia lenticularis Michx	Catchfly grass.
Leersia oryzoides (L.) Sw	Rice cutgrass.

[5] These plants were observed in the field or compiled from Deam's (*2*, *3*) books on shrubs and grasses. So far as possible, the botanical names have been verified by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, Soils, and Agricultural Engineering.

Leersia virginica Willd	Whitegrass.
Muhlenbergia sylvatica Torr	
Panicum anceps Michx	
Panicum clandestinum L	
Panicum dichotomiflorum Michx	
Paspalum repens Bergins	Horsetail paspalum.
Sporobolus neglectus Nash	

Lowlands, better drained bottoms, and flats:

Shrubs

Amorpha fruticosa L	Indigobush.
Campsis radicans (L.) Seem	Trumpetcreeper.
Corylus americana Walt	American hazel.
Evonymus atropurpura Jacq	Wahoo.
Ptelea trifoliata L	Common hoptree.
Rubus allegheniensis Porter	Alleghany blackberry.
Rubus impos Bailey	Highbush blackberry.
Rubus hispidus L	Swamp dewberry.
Sambucus canadensis L	Elderberry.
Smilax hispida Muhl	Hispid greenbrier
Spiraea alba Du Roi	Meadow spirea.
Symphoricarpos orbiculatus Moench	Coralberry.
Toxicodendron radicans (L.) Kuntze	Poison-ivy.
Vitis labrusca L	Fox grape.

Grasses

Alopecurus carolinianus Walt	Foxtail.
Andropogon elliottii Chapm	Elliott beardgrass.
Andropogon furcatus Muhl	Bluejoint turkeyfoot or big bluestem.
Andropogon virginicus L	Broomsedge.
Cenchrus pauciflorus Benth	Field sandbur.
Cynodon dactylon (L.) Pers	Bermuda grass.
Danthonia spicata (L.) Beauv	Poverty oatgrass.
Elymus virginicus L	Virginia wild-rye.
Leptochloa filiformis (Lam.) Beauv	Red sprangletop.
Muhlenbergia mexicana (L.) Trin	Wirestem muhly.
Panicum capillare L	Witchgrass.
Panicum polyanthes Schultes	
Panicum virgatum L	Switch grass
Paspalum circulare Nash	
Phleum pratense L	Timothy.
Sorghastrum nutans (L.) Nash	Indian grass.
Sorghum vulgare Pers	Sorghum.
Spartina pectinata Link	Prairie cordgrass.
Sporobolus neglectus Nash	
Uniola latifolia Michx	Broadleaf uniola.

Well-drained wooded slopes and flats:

Shrubs

Bignonia capreolata L	Crossvine.
Hydrangea arborescens L	Smooth hydrangea.
Hypericum prolificum L	Shrubbery St. Johnswort
Smilax bona-nox L	Fringed greenbrier.
Smilax rotundifolia L	Round-leaved greenbrier.
Toxicodendron radicans (L.) Kuntze	Poison-ivy.
Viburnum acerifolium L	Mapleleaf viburnum

Grasses

Agrostis perennans (Walt.) Tuckerm	Autumn bentgrass.
Brachyelytrum erectum (Schreb.) Beauv	
Bromus latiglumis (Shear) Hitchc	
Bromus purgans L	Canada brome.
Deschampsia caespitosa	Tufted hairgrass.
Festuca obtusa Spreng	Nodding fescue.
Hystrix patula Moench	Bottlebrush.
Muhlenbergia glabriflora Scribn	
Muhlenbergia sobolifera (Muhl.) Trin	
Panicum boscii Poir	
Panicum huachucae Ashe	
Panicum microcarpon Muhl	
Panicum oligosanthes Schultes	
Panicum polyanthes Schultes	
Poa sylvestris Gray	Sylvan bluegrass.
Triodia flava (L.) Smyth	Purpletop.

Open upland areas, including idle fields, eroded land, fence rows, roadsides, and railroad right-of-ways:

Shrubs

Ceanothus americanus L	Jersey-tea.
Celastrus scandens L	American bittersweet.
Parthenocissus quinquefolia (L.) Planch	Virginia creeper.
Rhus copallina L	Shining sumac.
Rhus typhina L	Staghorn sumac.
Rosa carolina L	Pasture rose.
Rosa setigera Michx	Prairie rose.
Rubus allegheniensis Porter	Alleghany blackberry.
Rubus flagellaris Willd	Northern dewberry.
Rubus occidentalis L	Common blackcap raspberry.
Salix humilis Marsh	Upland willow.
Smilax glauca Walt	Sawbrier.
Toxicodendron radicans (L.) Kuntze	Poison-ivy.
Vitis aestivalis Michx	Summer grape.
Vitis cinerea Engelm	Sweet winter grape.
Vitis vulpina L	Frost grape.

Grasses

Agropyron repens (L.) Beauv	Quackgrass.
Agropyron smithii Rydb	Bluestem or western wheatgrass.
Agrostis hiemalis (Walt.) BSP	Ticklegrass.
Andropogon elliottii Chapm	Elliott beardgrass.
Andropogon virginicus L	Broomsedge.
Bromus commutatus Schrad	Hairy chess.
Bromus secalinus L	Chess or cheat.
Bromus tectorum L	Downy chess.
Cenchrus pauciflorus Benth	Sandbur.
Eleusine indica Gaertn	Goosegrass.
Elymus virginicus L	Virginia wild-rye.
Eragrostis capillaris (L.) Nees	Lacegrass.
Eragrostis cilianensis (All.) Link	Stinkgrass.
Eragrostis frankii C. A. Meyer	Sandbar lovegrass.
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass.
Eragrostis spectabilis (Pursh.) Steud	Purple lovegrass.
Festuca octoflora Walt	Sixweeks fescue.
Hordeum nodosum L	Meadow barley.
Hordeum pusillum Nutt	Little barley.
Muhlenbergia brachyphylla Bush	
Panicum dichotomiflorum Michx	

Panicum gattingeri Nash	
Panicum lindheimeri Nash	
Panicum philadelphicum Bernh	
Panicum tennesseense Ashe	
Paspalum pubescens Muhl	
Paspalum publiflorum Rupr	
Phleum pratense L	Timothy.
Setaria viridis (L.) Beauv	Green bristlegrass.
Sporobolus vaginiflorus (Torr.) Wood	
Triodia flava (L) Smyth	Purpletop.

Cultivated fields, rotational land, and pastures:

Grasses

Aristida dichotoma Michx	Churchmouse three-awn.
Aristida longespica Poir	Slimspike three-awn.
Aristida oligantha Michx	Prairie three-awn.
Aristida ramosissima Engelm	S-Curve three-awn.
Dactylis glomerata L	Orchard grass.
Digitaria ischaemum (Schreb.) Muhl	Smooth crabgrass.
Digitaria sanguinalis (L.) Scop	Crabgrass.
Echinochloa crusgalli (L.) Beauv	Barnyard grass.
Muhlenbergia schreberi J. F. Gmel	Nimblewill.
Panicum agrostoides Spreng	
Panicum capillare L	Witchgrass.
Phleum pratense L	Timothy.
Poa chapmaniana Scribn	Chapman's bluegrass.
Poa compressa L	Canada bluegrass.
Poa palustris L	Fowl bluegrass.
Setaria viridis (L.) Beauv	Green bristlegrass.

Some of the common weeds occurring in fields are wild carrot, milkweed, plantains, foxtail, horseweed, ragweed, smartweed, wild lettuce, dandelion, wild onion or garlic, dodder, morning-glory, cocklebur, and trumpetcreeper. Dodder usually frequents clover and lespedeza fields.

ORGANIZATION AND POPULATION

Vanderburgh County was organized January 7, 1818, by an act passed by the General Assembly of Indiana (*5*). It was named in honor of Judge Henry Vanderburgh, who was in no way associated with the organization of the county.

The historical beginnings of Vanderburgh County all center about the organization and growth of Evansville, which is the county seat. About 1800 a settlement known as Saundersville was made. This settlement was composed of English, Irish, and Scotch immigrants. In the western part of the town was a settlement known as Lamasco, built up by German immigrants. George Miller was one of the early settlers who later moved to Perry Township. He came from Kentucky in 1809 and settled on the corner of Vine and Riverside Streets. Hugh McGary, one of the first permanent white settlers, purchased land, now a part of Evansville, from the Government on March 27, 1812. Previously and for years afterward, the Shawnee Indians had a village near the mouth of Pigeon Creek.

On June 14, 1814, Evansville was authorized as the seat of justice for Warrick County to which it belonged at that time. The town was named in honor of Gen. Robert M. Evans, a distinguished soldier and

citizen of Gibson County. At that time General Evans was in no way identified with the organization of Evansville. Colonel McGary and General Evans had been neighbors prior to this time.

After the revolution of 1848 on the Continent, many Germans came to this section. The French and English came after the Napoleonic Wars, the Irish after their rebellion in the mother country, and some southerners migrated to the North after the Civil War.

The Angel Mounds in the southeastern part of the county are of historical interest because they probably represent the first human settlement of Vanderburgh County—the beginnings of primitive culture. Archæological excavations were begun in 1939 to include the old Indian village site and the mounds, which were generally used for burial places although some undoubtedly were built for ceremonial purposes and for fortifications.

All the industries of the county are in Evansville. The city has 185 leading modern industries, manufacturing more than 200 different products. Evansville is one of the most important manufacturing cities in the State of Indiana. In 1937 it had a population of approximately 100,000, an employed population of more than 39,000, and an annual pay roll exceeding $45,000,000.[6]

Evansville is rapidly becoming the base of operations for the oil industry of the tri-State area, including Illinois, western Kentucky, and southwestern Indiana. A number of small wells are producing in Vanderburgh County, but most of the activity has been outside of the county. In 1939 a large number of farms in Armstrong and Scott Townships were under oil leases.

Although only two coal mines were operating in the county in 1939, Evansville is within a 50-mile radius of a number of rich coal mines outside the county.

These industries have drawn much of the farm help to the city so that farm labor now is short during planting and harvest time. At such times it becomes necessary to bring help in from outside the county.

According to the 1940 census, the population of the county was 130,783, of which 97,062 was urban and 33,721 was rural. The density of rural population in 1940 averaged 139.9 persons per square mile. In 1930 the urban population was 102,249 and the rural population 11,071. All the urban population is centered at Evansville. The rural population is probably fairly uniformly distributed throughout the county, as no very large farms exist. Probably the smallest farms are nearest to Evansville.

Evansville is the only city in Vanderburgh County that has all modern conveniences. A number of small settlements are near Evansville, which, owing to the rapid expansion of Evansville, have become almost contiguous to the city. These are Howell, Smithland, Kratzville, Highland, Zipp, and Stringtown. Howell is a railroad town. St. Wendells (which lies mostly in Posey County), Martin, Armstrong, Darmstadt, Inglefield, and Daylight are small villages in the northern part of the county. Post offices are located at Evansville, Howell, Armstrong, and Inglefield. The small settlements serve as a nucleus around which farming communities have developed. These communi-

[6] Information obtained from Evansville Chamber of Commerce.

ties have churches, schools, and general stores. Many of these localities are near a railroad, which serves as an outlet for their agricultural products. Since the building of better roads and the advent of trucking, most of the farm products are trucked into Evansville.

Churches and grade schools, both public and parochial, are well distributed throughout the county. Secondary schools are maintained at small villages and at Evansville. Evansville College, a 4-year school, is located in the city. Churches of all denominations can be found in Evansville.

Rural electrification has been extended to large areas within the last decade. Electric lights and telephones are available in all areas adjoining the principal roads and in small communities.

Most of the farm homes and outbuildings in good farming sections are of substantial frame construction and are kept in good condition. In the poorer agricultural sections the buildings are not in so good a state of preservation or upkeep as in the better farming sections. Many beautiful country homes have been built outside of Evansville in the hilly sections of the county. The suburban section of Evansville now extends many miles east, north, and northeast of the city.

The farms are fenced wherever cattle are kept. Electric fencing is popular for fields of rotational or temporary pasture.

TRANSPORTATION, MARKETS, AND INDUSTRIES

Five major railroads serve the county. These railroads all come into Evansville. The first railroad was put into operation in 1853. It is now known as the Chicago & Eastern Illinois Railway and connects Evansville with Terre Haute and Chicago. The New York Central system operates a branch line from Evansville to Chicago and a line connecting with roads to Indianapolis. The Illinois Central Railroad connects Evansville with Peoria and Decatur. The Louisville & Nashville Railroad and a branch line of the Southern Railway system pass through the southwestern and southern parts of the county, respectively. The Evansville & Ohio Valley Railway, running east from Evansville, is an electric line used for hauling freight. In addition to the railroads, bus service is available to practically all points. Many trucking companies are now in operation hauling freight on regular schedules between principal traffic centers.

A number of barge lines furnish water transportation between Evansville and other inland river cities and gulf ports. A modern river-rail terminal is in Evansville.

One of the earliest attempts to provide water transportation to inland cities was the Wabash and Erie Canal. Today it is only of historical interest, although its route can still be followed across the county. In 1853 the canal was extended from the north to Evansville. It had a total length of 459 miles, 357 of which were in Indiana (*5*). The Miami Canal, 181 miles long, connected Evansville with Cincinnati. Faulty construction and poor boat service led to its being abandoned about 1864.

Evansville has a modern airport with a 254-acre landing field. At present only charter passenger service is available.

A network of good roads traverses the county. The principal thoroughfares are hard-surfaced; other primary roads are graveled,

whereas the secondary ones are of dirt. The secondary roads form a relatively small proportion of the total network. Most of these are passable to automobiles throughout the year, although some are traveled with difficulty in the winter and spring. United States Highway No. 41 traverses the county in a north-south direction. Four State highways lead from Evansville to various centers.

Practically all farm products are shipped into Evansville, where they are processed or consumed. Some corn and soybeans are shipped out, but most of the wheat is used by local flour mills and grain elevators. A small grain elevator is located at Armstrong. The mills grind wheat for flour and produce feed for livestock and poultry as a byproduct. Many bakeries are in operation, which probably use some of the flour milled from wheat produced within the county. Milk is collected from farms and delivered by truck to Evansville, where local dairies distribute it or its products to consumers. A tomato-processing factory at Evansville uses all the tomatoes grown within the county, as well as many of those grown in nearby areas. Truck crops and poultry products are brought into Evansville by farmers and sold direct to the consumers either at public markets or from house to house. Evansville's stockyards handle all the cattle, hogs, and sheep of the county that are shipped to market, as well as those of nearby areas of southeastern Illinois, northwestern Kentucky, and southern Indiana. A number of large packing companies maintain slaughtering and processing plants in Evansville.

CLIMATE

The climate of Vanderburgh County is continental, with hot summers and moderately cold winters.

Moderate differences exist between the mean winter and summer temperatures with frequent cold spells occurring during the winter months. The mean annual temperature, according to United States Weather Bureau data, is 57° F. The difference between the mean summer and mean winter temperatures is 41.5°. The lowest recorded temperature is 16° below zero and the highest recorded temperature is 107°. Frequent high temperatures of 88° to 95° are recorded in summer and frequent low winter temperatures range from 26° to 30°.

Winters are sufficiently mild for growing cover crops of wheat, barley, and oats. Winter oats are not planted extensively as yet, although indications are that plantings may increase with the introduction of suitable varieties. Spring and summer temperatures are too high for the successful growing of spring oats. Some winter vegetables, such as turnips, cabbage, and kale, are grown. Except on unusually cold days, the winters are open enough for outdoor work.

The average length of the frost-free period is 211 days, from April 2, to October 30. Killing frost has been recorded as late as April 26 and as early as September 30. The growing season is long enough to mature the crops commonly grown. Unusually late frosts may damage fruit trees when they have had an early start.

The mean annual precipitation recorded at Evansville is 43.16 inches. Although the heaviest rainfall occurs in the spring and the lightest in the fall, the variation between the mean rainfall for each of the seasons is not large. The total precipitation in the driest

year, 1930, was 25.60 inches and in the wettest year, 1882, was 70.61 inches. Some of the precipitation falls in the form of snow, which averages 16.6 inches a year. Only a little more than half of the annual rainfall comes during the growing season, and much of this comes as a hard rain during thundershowers. Such a rain tends to run off rapidly without greatly benefiting the crops. These facts, together with the high summer temperatures, tend to create frequent droughty conditions in the fall. This condition is detrimental to late pastures and occasionally to the sprouting of wheat. The relative humidity ranges from about 49 to 82 percent. High humidity reduces transpiration from plants and tends to check evaporation to some extent. High humidity and high temperatures favor the growth of corn.

Table 1 shows the normal monthly, seasonal, and annual temperature and precipitation as recorded at Evansville.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Evansville, Vanderburgh County, Ind.*

[Elevation, 388 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year (1930)	Total for the wettest year (1882)	Average snowfall
	°F	°F	°F	Inches	Inches	Inches	Inches
December	37.1	72	−10	3.54	1.69	5.50	3.3
January	33.5	71	−16	3.74	6.20	5.95	5.4
February	36.3	75	−15	3.24	3.12	14.62	4.5
Winter	35.6	75	−16	10.52	11.01	26.07	13.2
March	45.9	87	4	4.19	1.97	4.72	2.3
April	56.7	90	24	3.90	1.10	4.17	.3
May	66.7	98	35	3.86	1.02	8.45	(1)
Spring	56.4	98	4	11.95	4.09	17.34	2.6
June	75.1	101	44	4.04	2.28	5.25	.0
July	78.9	107	54	3.42	1.23	6.05	.0
August	77.4	105	48	3.36	1.29	6.70	.0
Summer	77.1	107	44	10.82	4.80	18.00	.0
September	70.7	104	33	3.31	3.39	3.30	.0
October	59.4	93	23	2.82	1.31	2.25	.2
November	46.6	81	4	3.74	1.00	3.65	.6
Fall	58.9	104	4	9.87	5.70	9.20	.8
Year	57.0	107	−16	43.16	25.60	70.61	16.6

1 Trace.

Sometimes late frosts damage fruit blossoms that have made an early start. As frost damage is more likely to occur in the valleys than on the ridge tops, orchards are located on the tops of hills. Fluctuations of temperature around the freezing point cause freezing and thawing of the ground and heaving, which breaks the roots of clover, wheat, alfalfa, or other crops, thereby killing or stunting these plants. Such damage is more frequent in the soils that are not well drained. In some areas upland soils that have a loose surface and subsoil are also subject to heaving in the winter. This condition has been reported for Memphis silt loam.

Owing to the almost constant danger of infestation by the Hessian fly, wheat cannot be sown earlier than the first part of October (*13*). Garlic must be controlled by plowing at the right time when the land is not in wheat. It is necessary to plow in late fall, winter, or early spring before the new bulblets form. Clean plowing with all top growth turned under and kept under until dead is necessary (*13*).

Periodic flooding by the Ohio River determines the type of farming that can be successfully followed on the Ohio River bottoms. It is not practical to grow wheat. Occasionally the Ohio River rises to damaging levels, as in 1913 and 1937. During the month of January 1937 a rainfall of 14.78 inches, most of which fell in about 5 days, caused flood damage exceeding that of all previously recorded floods. Many hundreds of thousands of dollars' worth of livestock, grain, buildings, and other property was washed away. Roads and telephone poles were destroyed. Large tracts of land were badly scoured. As a protection against floods many homes in this section have local flood walls. A levee protecting the city of Evansville was begun in 1939 along the Ohio River and Pigeon Creek.

In general, Vanderburgh County is not a windy area. Occasional winds, having a maximum velocity of 28 to 38 miles per hour, are recorded, but gales of 40 miles or more per hour are rare. Hailstorms are not frequent. In the spring of 1940 a tornado was reported to have struck the western part of the city of Evansville, causing some damage to property.

AGRICULTURE

Because of the greater accessibility of that part of the county, the early settlements in Vanderburgh County were along the Ohio River. Most of these settlements were on the rolling lands in the southern part and were well-forested and stocked with wild game. The timber provided lumber for the construction of homes and buildings and furnished all the fuel that was needed. As the timber was removed and roads were built, settlement spread farther north from the river. In the pioneer days more livestock was raised than now, as livestock could be more easily marketed than crops. General farming was the dominant type of agriculture in the early development of the county.

In the last quarter century general farming with some degree of specialization along certain lines has developed because of the nature and condition of the land and as a result of economic factors, such as nearness to markets, brought about by the building of railroads and highways. The rapid growth and expansion of the city of Evansville has created a home market for milk, poultry products, vegetables, timber, grain, and other agricultural products.

In the northern and southern hill sections northwest and southwest of Evansville, general farming is carried on. These sections include large areas of land that are too steep or too badly eroded for farming. Farming is confined to the narrow ridge tops and valleys. Orchards are a part of almost every farm, although commercial orchards are few. Vegetables are raised on the areas nearest to Evansville. In the northwestern part of the county general farming includes dairying and hog raising. In the north-central and eastern parts of the county north of

Pigeon Creek, dairying is carried on extensively, whereas south of Pigeon Creek and also south of Bayou Creek on the Ohio River terraces cash-grain farming predominates. On the Ohio River flood plain corn and soybeans are practically the only crops grown.

CULTIVATED CROPS

The acreages of the principal crops in stated years are given in table 2.

TABLE 2.—*Acreages of the principal crops in Vanderburgh County, Ind., in stated years*

Crop	1879	1889	1899	1909	1919	1929	1939
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Corn	24,890	25,412	30,316	31,335	27,453	23,043	23,309
Oats	1,314	4,131	1,425	1,629	2,690	1,715	1,160
Wheat	29,218	30,874	39,503	32,985	31,625	18,357	15,187
Barley	40	7				5	1,467
Rye	24	23	83	82	102	18	32
Potatoes		1,833	1,354	1,269	1,102	604	351
Vegetables, including sweetpotatoes	45	[1] 28	1,390	1,516	1,022	1,255	529
Soybeans						3,630	11,356
Cowpeas						1,190	1,061
Hay	8,695	17,936	17,064	16,038	17,489	12,446	12,634
Timothy and timothy and clover mixed				7,525	8,077	5,513	[2] 3,724
Clover alone			8,343	4,661	6,429	3,390	
Lespedeza						[3] 248	[3] 2,130
Alfalfa				155	849	1,094	1,352
Other tame grasses			8,008	1,350	1,173	491	454
Small grains cut for hay			713	2,347	412	95	65
Legumes for hay					549	1,615	4,909
	Trees	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*
Apples		60,163	81,397	40,063	20,998	32,211	23,072
Peaches		5,666	51,382	22,429	11,982	24,537	9,217
Pears		1,809	20,194	11,339	4,701	2,914	1,632
Cherries		2,971	9,838	6,666	3,844	1,454	676
	Vines	*Vines*	*Vines*	*Vines*	*Vines*	*Vines*	*Vines*
Grapes			86,048	61,861	39,002	27,881	13,624

[1] Sweetpotatoes only.
[2] Timothy and clover, alone or mixed.
[3] Includes some sweetclover.

The value of all agricultural products by classes in stated years is given in table 3.

TABLE 3.—*Value of agricultural products by classes in Vanderburgh County, Ind., in stated years*

Product	1909	1919	1929	1939
Cereals	$1,311,355	$2,330,073	$820,572	$751,204
Other grains and seeds	12,559	30,416	84,004	109,691
Hay and forage	246,676	702,528	227,742	172,402
Vegetables (including potatoes and sweetpotatoes)	178,719	388,367	239,597	71,451
Farm garden vegetables (excluding potatoes and sweetpotatoes) for home use only	(1)	(1)	52,176	126,430
Fruits and nuts	70,727	126,081	103,405	62,207
All other field crops	105,750	17,697	1,556	6,949
Nursery, greenhouse, and hothouse products, etc., sold	(1)	(1)	64,330	147,863
Forest products sold	(1)	(1)	6,233	390
Livestock and products				
Animals sold and slaughtered	256,113	(1)	(1)	259,831
Dairy products sold	262,012	504,210	396,176	232,437
Poultry and eggs produced	148,719	275,474	383,895	199,684
Wool, mohair, and goat hair	[2] 790	[2] 1,625	899	[2] 742
Honey	1,083	2,837	712	68

[1] Not reported. [2] Wool only.

It can be seen from table 2 that the acreage in corn was about the same in 1939 as in 1929 and that the acreage in wheat decreased slightly from 1929 to 1939. The acreage in corn is much less than it was in 1909, when it appears to have reached a maximum. The acreage in wheat has declined even more. In 1939 the area devoted to wheat was less than half of that reported in 1899.

According to a report by Visher (*11*) for the period 1923–37, corn occupied 18 percent of the total land area and 42 percent of the cropland; wheat, 14 percent of the total land area and 33 percent of the cropland; oats, 2 percent of the total land area and about 3 percent of the cropland.

The data in table 4 give the average acre yields of corn and wheat harvested for consecutive years for the period 1923–39.

TABLE 4.—*Summary of average acre yields of corn and wheat harvested in Vanderburgh County, Ind., during the period 1923–39* [1]

Year	Corn	Wheat	Year	Corn	Wheat
	Bushels	*Bushels*		*Bushels*	*Bushels*
1923	34.4	13.4	1932	40.0	12.4
1924	36.0	12.9	1933	38.0	14.5
1925	40.6	20.7	1934	30.7	21.9
1926	33.0	20.2	1935	33.6	9.9
1927	38.0	10.3	1936	18.6	16.4
1928	24.0	8.0	1937	43.3	22.9
1929	33.1	14.1	1938	45.6	16.4
1930	15.7	16.0	1939	48.0	18.7
1931	40.0	29.0			

[1] Compiled from the Indiana Crops and Livestock Annual Summaries, which are prepared by the Department of Agricultural Statistics of the Purdue University Agricultural Experiment Station in cooperation with the United States Department of Agriculture.

Most of the variations in crop yields recorded can be attributed to climatic variations. The two worst years for corn during this period were 1930 and 1936 when average yields of 15.7 and 18.6 bushels, respectively, were obtained. The highest average yield of 48 bushels was obtained in 1939. A maximum average yield of 51 bushels an acre was reported by Visher (*11*) for the period 1923–36. A long-time average, however, is more accurate than one based on a short period. This same author has found the average to be 36 bushels of corn an acre for a period of 15 years up to 1937. The commonly expected yields or range of yields are from 33 to 39 bushels an acre. Only the two poorest years of a decade will have averages less than 33 bushels, and only the two best years will have averages of more than 39 bushels an acre. When the maximum yield and the relatively high average yields are considered, it appears that a large proportion of the corn acreage occupies land that is well adapted to corn. The large areas of alluvial soils on the Ohio River flood plain have been chiefly responsible for the high averages obtained. Some fields in this section yield over 100 bushels an acre in favorable years.

According to table 4, the maximum average yield of wheat was 29 bushels an acre (1931) and the minimum was 8 bushels (1928). The year 1935 was also a bad year for wheat, as an average yield of only 9.9 bushels an acre was obtained. An 18-year average, 1920–37, for most of the county is 15 bushels an acre (*11*). The northeastern part of the county has an average yield of 14 bushels an acre. Wheat is grown more extensively on upland soils, including land of various

slopes, than is corn. No wheat is grown on the fertile alluvial soils of the Ohio River flood plain. Visher (*11*) states that the average yield in 8 out of 10 years is 12 to 21 bushels an acre. The lower average is the yield that can be expected even in a poor year. The higher average is the yield that can be expected in good years.

The production of spring oats is not very successful in this county, because the hot weather usually occurs too early to allow proper development. Only about 3 percent of the cropland is in oats. The county average, based on a recent 15-year period, is 27 bushels an acre. The maximum average yield for most of the county is 39 bushels an acre. The lowest average yield is about 15 bushels an acre (*11*). The growing of spring oats is not encouraged by the county agent except for early spring pastures.

Wheat is a cash crop throughout the county wherever any significant quantity is raised. Most of it is taken into Evansville to grain elevators. In the cash-grain farming section and on the alluvial soils of the Ohio River, corn and soybeans are likewise cash crops. The corn raised in the other sections of the county is generally fed to cattle or hogs. Hay is raised chiefly for home consumption. The value of the grain crop, including corn, wheat, and oats, was $751,204 in 1939, which is considerably lower than in 1919 when the crop was valued at $2,330,073 (table 3).

Among the minor crops are tomatoes, potatoes, sweetpotatoes, and other vegetables. The tomato acreage appears to be on the decrease, according to Indiana crop estimates. Potatoes do not occupy a large total acreage, although practically every farmer raises enough for home consumption. Truck crops form the principal source of revenue on some of the small farms near Evansville. These products are sold in Evansville. The value of all vegetables (including potatoes and sweetpotatoes) produced in 1939 was $71,451. The value of farm garden vegetables, excluding potatoes and sweetpotatoes, for home use only, was $126,430 in 1939 and $52,176 in 1929.

Only a few commercial orchards exist, although practically every farm in the hilly section of the county has a few trees. The 1940 census lists the value of the fruit crop at $62,207 (table 3).

The usual crop rotations are corn, wheat, and hay, or corn, soybeans, wheat, and hay. Hay consists of lespedeza, timothy, and clover or red clover alone.

Cornland usually is plowed just before seeding but early enough to kill the growth of garlic, which is objectional in fields later sown to wheat. Erosion is severe in fields that are left barren for any length of time, or on hilly land during seasons of heavy rainfall. On the heavy-textured soils, most of which occupy nearly level areas, fall plowing is a good practice in order to allow alternate freezing and thawing to mellow the soil and improve its tilth.

Corn usually is planted with a corn planter during the early part of May. In the Ohio River bottoms corn frequently is planted after the middle of May, as the soils there retain moisture for some time after the late spring floods. Corn generally is husked in the field by hand in the latter part of October. In large fields, particularly on the Ohio River bottoms, the corn is picked by a corn picker. A very small part of the corn on the silty alluvial soils is cut by hand and shocked in rows to allow the sowing of wheat. After the corn is husked the stalks are cut or broken and disked into the ground

in order to prepare the seedbed if the land is to be sown to wheat or other small grain. Wheat is usually sown in the early part of October with a wheat drill. Fertilizer is applied at the same time. Red Clover, timothy and red clover, and timothy and redtop or lespedeza are sown with the wheat, which acts as a nurse crop. Winter oats, when sown, usually furnish early pasture. Wheat is cut by binders on the smaller farms of the hilly sections and by combines on the smoother areas, most of which are relatively large.

Where soybeans follow corn in the rotation, rye or rye and vetch should be sown as a cover crop between the cornstalks. This is frequently not done. In spring after the cornstalks are cut and disked or plowed into the ground, soybeans are sown and the mature crop is combined for seed or cut for hay.

Where wheat follows soybeans, the preparation of the seedbed is relatively simple Generally a light disking of the soybean stubble is all that is required before drilling in the wheat.

In 1939, 466 farms, or 28.4 percent of all farms, reported an average expenditure of $59.00 for fertilizer. In 1919, 743 farms, or 44.2 percent of all farms, reported an average expenditure of $82.20 per farm for fertilizer. The use of fertilizer for some crops on the soils of the uplands is more or less general. Most frequently these crops are wheat and barley, which receive applications of 75 to 200 pounds of 2–12–6 [7] or 2–16–8 fertilizer, usually only 100 pounds is used. Corn is not universally fertilized, but many farmers are finding it profitable to use some fertilizer on corn grown on the soils of the uplands. In general less fertilizer is used on corn than on wheat. The most common analyses of fertilizer used for corn are 0–10–10 and 0–20–20, but some 0–14–6 and superphosphate fertilizers are also used. Soybeans are heavy feeders of phosphate and potash, which are usually supplied by fertilizing corn and wheat. Potatoes are commonly grown on small lots of high fertility. They are manured and given applications of fertilizer ranging from 100 to 500 pounds. Frequently the fertilizer applied is the same as for corn or wheat, or a 2–16–8 mixture. The types and the amounts of fertilizer used are not always those recommended by the State experiment station. Information on recommended fertilizers can be obtained by consulting the local county agent or by writing for Purdue University Agricultural Experiment Station Circular 162 (*12*). These agencies are prepared to make quick tests on soils in order to aid the farmer in choosing the fertilizer best adapted to his soil conditions and crop requirements.

The use of lime is general only in Armstrong Township. Lime is used elsewhere throughout the county on soils of favorable slope as on McGary silt loam and on the alluvial soils of the tributaries of Pigeon Creek. Many thrifty alfalfa fields are maintained on various types of soils. These fields require heavy applications of lime. All soils, except the dark-colored soils of depressions and the first bottoms and low terraces of the Ohio River, need lime for growing alfalfa.

Most of the fertilizer is bought ready-mixed. Some of it is bought cooperatively by small groups or through farm-bureau agencies, but most of it is sold by dealers.

[7] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

PASTURES

Most of the pastures in this county are rotational ones, classified as plowable pastures in the census data. The principal pasture plants are lespedeza, red clover and timothy, timothy and redtop, and some red clover. According to census data only 152 acres of sweetclover was grown for pasture in 1929. Plowable pasture constituted about 13 percent of all the land in farms in 1939 and approximately 12 percent in 1929. In 1929 Scott Township led all others in the proportion of plowable pasture, followed in order by Knight, Center, Armstrong, and Perry Townships. Woodland pasture and other types of pasture constitute only a small proportion of the total acreage in pasture. Some small areas of permanent pasture that have been limed support a sod of white clover, Canada bluegrass, Kentucky bluegrass, and timothy.

Most of the so-called permanent pastures are chiefly steep and eroded lands that are lying idle. These support a poor sod of pasture grasses and plants and are overrun by weeds and shrubs. Lespedeza is the most common desirable pasture plant in such fields. The grasses consist of green foxtail, broomsedge, quackgrass, bluestem or western wheatgrass, ryegrass, barley grass, ticklegrass, lovegrass (*Eragrostis* sp.), sixweeks fescue, goosegrass, three-awn, and crabgrass.

Fields have been allowed to lie idle because of serious sheet and gully erosion, and the need for pasture has not been great enough to require reclamation of these idle fields. More cattle are not grazed probably because more cultivable land is needed to raise the required grain and hay for feed during the winter. The arable land in the hilly section is confined to the narrow ridge tops and small bottoms. Sheep could be profitably grazed if the fertility of the land were built up and maintained by the use of lime and fertilizers. Sheep raising is being encouraged by the county agent. Most of the soil on the slopes is mapped as Vanderburgh silt loam and most of the soil on the ridge tops is mapped as Zanesville, Hosmer, and Memphis silt loams. The severely eroded areas are mapped as rough gullied land (Vanderburgh soil material).

LIVESTOCK

Most of the cattle raised in the county are for dairy purposes. According to the Federal census the number of cattle over 3 months of age on April 1, 1940, was 5,479, and the number milked during 1939 was 3,261, as compared with 6,023 cattle over 3 months of age on April 1, 1930, and 4,342 cows milked during 1929. The production of milk decreased from 2,369,951 gallons in 1929 to 1,815,497 gallons in 1939. Apparently, the number of dairy cattle and beef cattle decreased slightly during that period.

The dairy cattle are chiefly Guernsey, Holstein-Friesian, and Jersey breeds. The chief beef-cattle breeds are Hereford and Aberdeen Angus. According to the Federal census, the value of cattle in 1940 was $252,581 and there were in that year 146 dairy farms, most of which were in the eastern and northern parts of the county, and in Scott, Center, and Armstrong Townships. The value of dairy products sold in 1939 ranked third in the value of agricultural products. Milk and cream are consumed in Evansville and beef cattle

are slaughtered at the Evansville stockyards and processed by local packing plants.

According to the Federal census, sheep and lambs over 6 months of age had increased to 603 head in 1940 from 566 head in 1930. In 1940 the value of the sheep and lambs was $3,775. Apparently, there is some tendency to raise more sheep in order to utilize some of the hill pastures. Most of the sheep are in the hilly sections of the county.

According to the Federal census, the number of hogs of all ages decreased from 17,038 in 1920 to 9,135 on April 1, 1930. On April 1, 1940 hogs over 4 months of age numbered 9,209, as compared with 5,339 over 3 months of age in 1930. In 1940, the value of hogs according to the Federal census, was $91,888. The chief hog-raising section of the county is Armstrong Township, where 40 to 50 hogs are kept on most farms, but a few hogs are kept for home consumption on practically every farm in the county. The hogs are mainly Poland China, Duroc-Jersey, and Chester White. Evansville is the outlet for hogs sent to the market.

Poultry raising is important on many of the small farms of the county, particularly those near Evansville. The 1940 census lists 91 farms out of a total of 1,641 as poultry farms whose principal source of income was from the sale of poultry or poultry products. The value of poultry and eggs in 1939 was second to the animals sold and slaughtered and dairy products sold, as can be seen from table 3. On April 1, 1930, the number of chickens reported was 91,467, whereas on April 1, 1940 the number was 69,425.

According to the Federal census, there were 1,312 horses and 1,972 mules over 3 months of age on farms on April 1, 1940. This represented a somewhat smaller number than in 1930. Many of the horses and mules are raised on the farms, the number on each farm varying with the size and type of farm. Some of the small truck farms may have only one horse, although the average is about two. The largest number of horses, an average of about five per farm, are kept on the cash-grain farms. These farms likewise have the greatest number of acres per farm. The average for the rest of the farms is three or four horses.

In 1939, 65.1 percent of the farms reported an expenditure of $163,858 for feed, or an average of $153.28 per farm reporting. Fewer farms bought feed in 1939 than in 1919, when approximately 86 percent of the farms reported such an expenditure, or an average of $317.52 per farm reporting. The feed purchased was used for cattle, poultry, and work animals.

FARM TENURE AND LABOR

In 1940 owners operated 83.1 percent of all farms, tenants 16.5 percent, and managers 0.4 percent. Tenancy has decreased from 21.1 percent in 1930.

Farm land can be rented either for cash or on a share-crop basis. One system pays the owner one-third and the operator two-thirds, with the operator furnishing everything. In some parts of the county, as in Armstrong Township, the owner receives two-fifths of the crop and the operator three-fifths, with the operator furnishing everything. If the owner pays one-half the cost of the seed, fertilizer, and threshing, he receives one-half of the income.

In 1939, 603 farms, or 36.7 percent of all farms, reported a total expenditure of $181,108 for labor, or an average of $300.34 per farm. This amount is less than in 1919 when 972 farms spent $458,993, or an average of $472.22 per farm. In recent years farm labor at planting and harvest time has been difficult to obtain, owing to the migration of a large proportion of the farm help to Evansville.

Labor is hired and paid for by the day. Corn pickers and shuckers are usually paid by the bushel. During threshing time small groups of farmers cooperate, thereby supplying the needed labor.

FARM INVESTMENTS AND IMPROVEMENTS

The average investment in land, buildings, and machinery in the county in 1930 was $103.13 an acre, or $8,590 for each farm. The investment in 1930 was distributed as follows: 61.7 percent in land, 32.5 percent in buildings, and 5.8 percent in farm implements. The corresponding value per farm in 1940 decreased to $7,286 as the average size of farms decreased from 83.3 acres to 67.2 acres, but the value per acre rose to $108.48. The investment in 1940 was distributed as follows: 55.6 percent in land, 37.0 percent in buildings, and 7.4 percent in farm implements.

Table 5 shows the average investment in land, buildings, and implements according to townships. Knight Township has the highest percentage of its investment in land and the least in implements. This township adjoins Evansville, and no doubt some of the high land values are due to this fact. Most of this township is a part of a cash-grain farming section, and some of the farms in the western part are relatively small. Most of the land is smooth, the northern part consisting of dark-colored soils and the southern part of light-colored acid soils derived from old alluvium.

TABLE 5.—*Average farm investment in land, buildings, and implements according to townships in Vanderburgh County, Ind., in 1930*

Township	Average acre value of farm land and buildings	Average acre value of farm land	Average percentage of farm investment in—		
			Land	Buildings	Implements
	Dollars	*Dollars*	*Percent*	*Percent*	*Percent*
Armstrong	66.64	44.57	63.9	31.6	4.5
Center	120.67	77.33	59.9	33.6	6.5
German	79.12	39.67	47.2	47.0	5.8
Knight	153.29	115.36	73.1	24.1	2.8
Perry	102.49	60.37	55.5	38.7	5.6
Pigeon	137.80	95.59	66.2	29.3	4.5
Scott	68.67	38.57	51.7	40.4	7.9
Union	106.47	80.31	69.0	22.5	8.5
Average for county	97.14	63.67	61.7	32.5	5.8

Union Township has the second highest proportionate investment in land and highest proportionate investment in implements. This township consists of smooth land, chiefly alluvial in origin. Cash-grain farming is the principal type carried on. The farms are large and adapted to power equipment.

In German Township the percentage of investment in buildings almost equals that in land. This township is chiefly hilly with narrow ridge tops, steep hillsides, and some small areas of bottom lands. How-

ever, the average acre value of farm land and buildings does not appear to be excessive.

Scott Township has the lowest average acre value of farm land. It has 51.7 percent of the total investment in land, 40.4 percent in buildings, and 7.9 percent in implements. This township is chiefly a dairying section and contains large areas of hilly land as well as fairly large areas of smooth land.

Armstrong Township, a prosperous general-farming section, has an average acre value for land of $44.57. It appears that twice as much is invested in land as in buildings.

The machinery and equipment on a farm depend on the type of farming carried on. In 1940 the total value of all farm implements and machinery was $880,641. The largest expenditure for equipment was on the farms of the Ohio River flood plain. Power equipment is used practically to the exclusion of horse-drawn equipment. Large tracts of smooth land lend themselves to such operations. The cash-grain farms were next in value of farm implements, followed in order by cattle farms, fruit farms, general farms, and truck farms.

On the Huntington, Lindside, and Melvin soils of the Ohio River bottoms, where corn and soybeans are practically the only crops, the average farm equipment consists of a tractor, 14-inch two-bottom plow, tandem disk, culti-packer or wooden roller, 2-row corn planter, rotary hoe, tractor cultivator, 8- or 12-foot grain drill for soybeans, and combine for soybeans. Some of the larger farms use 14-inch three-bottom plows, or disk plows. Corn pickers are increasing in popularity. In 1937 the assessor listed five mechanical pickers. The smaller farms in this section may have one or two teams of work animals, but the largest farms have only tractors. The buildings consist of a corn crib, implement shed, and barn.

On the upland soils developed from old alluvium, which includes the McGary, Montgomery, Wheeling, Sciotoville, Weinbach, and Ginat soils, where a cash-grain type of farming is carried on, the same farm implements and equipment, except corn pickers, are used. In addition a hay rake and mower are required. A larger percentage of the farm work is done with teams here than in the bottoms. Hay barns are lacking, as most of the hay is baled in the fields.

On the general-farming section of Armstrong Township and on the dairy farms of the eastern part of the county that have a high proportion of smooth farming land, the following equipment is found on the average farm: A 14-inch two-bottom plow, tandem disk, cultipacker or roller, corn planter, single-row corn cultivator, wheat drill, wheat binder, mower, rake, tedder, and manure spreader. Much of the work is done with horses, although the use of tractors is increasing on farms that have sufficient use for them. Steam threshing machines are common in this neighborhood. They are either owned by a group of farmers or by an individual who threshes for a company of farmers. Dairy barns and silos are prominent on the farms in this section, as well as corn cribs and hog and poultry houses.

Less equipment is used on the small farms in the hilly section of the county where general farming or truck farming is carried on. No tractors are used. The usual equipment consists of two-horse plows, corn planter, spike-tooth harrow, disk harrow, mower, hay rake, and riding cultivator. Wheat drills and binders are on the larger farms.

TYPE AND SIZE OF FARMS

Of the 1,641 farms listed in the 1940 census, 412 derived their main source of income from field crops, 146 from dairy products, 97 from livestock, 91 from poultry and poultry products, 39 from vegetables harvested for sale, 32 from horticultural specialties, 22 from fruits and nuts, and 733 from farm products used by farm households.

According to the 1940 census the average size of the 1,641 farms was 67.2 acres, and 71.5 percent of the land was in farms. The percentage of improved land in farms was 82.8 percent, with an average of 55.6 acres per farm. The farms range in size from 3 acres or less to 1,000 acres or more: 378 farms ranged in size from 3 to 9 acres, 218 from 30 to 49 acres, 220 from 70 to 99 acres, and 157 from 100 to 139 acres. Only 7 farms contained 500 acres or more. The tendency since 1929 has been to cut up the land into smaller units, especially in the areas nearest the city of Evansville, which is expanding to the north, east, and west. Country homes are being built along the principal hard-surfaced roads leading out of Evansville. The great increase in the number of 3- to 9-acre farms can be attributed to the increasing number of country home sites that are being purchased. Notable increases have also been recorded in the number of all farms below 50 acres in size.

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, are studied. Each excavation exposes a series of distinct soil layers, or horizons, called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil [8] and its content of lime and salts are determined by simple tests.[9] Drainage, both internal and external, and other external features, such as relief, or lay of the land, are taken into consideration, and the interrelation of soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, special emphasis being given to those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics soils are grouped into mapping units. The three principal ones are (1) series, (2) type, and (3) phase. Areas of land, such as coastal beach, fills, dumps, or excavations, that have no true soil are called (4) miscellaneous land types.

The most important group is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from a particular type of parent material. Thus, the series includes soils hav-

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[8] The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality, higher values indicate alkalinity, and lower values indicate acidity.

[9] The total content of readily soluble salts is determined by the use of the electrolytic bridge. Phenolphthalein solution is used to detect a strong alkaline reaction.

ing essentially the same color, structure, and other important internal characteristics and the same natural drainage conditions and range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Thus, Zanesville, Memphis, Alford, Vanderburgh, Markland, Wheeling, and Huntington are names of important soil series in this country.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Wheeling loam, Wheeling silt loam, and Wheeling fine sandy loam are soil types within the Wheeling series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a variation within the type that differs from the type in some minor soil characteristics that may have practical significance. Difference in relief, stoniness, and the degree of accelerated erosion are frequently shown as phases. For example, within the normal range of relief for a soil type, certain areas may be adapted to the use of machinery and the growth of cultivated crops and others may not. Even though no important differences are observed in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, important differences may exist in respect to the growth of cultivated crops. In such an instance the more sloping parts of the soil type may be segregated on the map as a sloping or hilly phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, and miscellaneous land types, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

The base maps used in mapping the soils of Vanderburgh County were aerial photographs. Most of these photographs were on a scale of 1 mile to approximately 3 inches, whereas the rest were on a scale of 1 mile to approximately 4 inches. The published map accompanying this report is on a scale of 1 mile to 2 inches. The area was traversed by car along the roads and by foot in between the roads. Hikes were generally undertaken at ¼-mile intervals so that it was necessary to map a distance of one-eighth mile from each line of traverse. In hilly dissected country the path of traverse was not always in a straight line because the view would not have been adequate. Frequent measurement of slopes and examination of other soil characteristics were necessary in order to map the soils correctly on the field sheets. The hilly section of this county is composed of short slopes, each with a number of breaks in the gradient. Generally the steepest parts occur near the bases of slopes. The approximate slope range between each break or between each change in the direction of the slope was determined for all the soils. It was found that one set of slope classes was satisfactory

for mapping all of the soils of this county. The range of each slope class is as follows: (A) 0 to 3 percent, (B) 3 to 6 percent, (C) 6 to 10 percent, (D) 10 to 14 percent, (E) 14 to 25 percent, and (F) 25+ percent. Most soil types have only one or two slope classes, although a few have more. Of course, the slope boundaries frequently coincide with the soil-type boundaries.

Sheet and gully erosion have been mapped and indicated on all field sheets. Four eroded phases of soil types subject to erosion are shown on the map, as follows: (1) No erosion designation, (2) eroded phase, (3) severely eroded phase, and (4) rough gullied land.

Soils with no erosion designation are those that are uneroded or that have not been sufficiently altered by accelerated erosion to interfere significantly with the productivity and workability of the soil. The eroded phases of soils are those that have lost sufficient amounts of the surface soil to affect the productivity materially. Gullies are not uncommon in such fields.

Severely eroded phases of soils are those that have lost the greater part or all of the surface layers (the A horizons) by erosion, thereby greatly reducing the fertility of the soil. Ordinary plowing will expose or turn up the subsoil in many places. Gullies are common on eroded fields of this kind.

Rough gullied land designates land so eroded that reclamation for ordinary agriculture is not economically feasible. Gullies are the main features of the landscape and are entrenched deeply in the subsoil or parent material. The intergully areas have lost a part or all of the surface soil.

SOILS

The soils of Vanderburgh County have developed under a hardwood forest and a humid temperate climate. The well-drained soils are characterized in their natural environment by a thin layer of organic matter overlying a leached grayish-brown surface soil. The organic matter has been formed from the decay of leaves and twigs. The soils of the county have been subject to leaching for a long period of time, which has removed much of the plant nutrients, including lime (calcium carbonate). Consequently, the soils are generally acid in reaction. Many individual differences exist between soils, depending on such conditioning factors as parent material, slope, internal and external drainage, age in place, and susceptibility to erosion. These differences are recognized by the establishment of soil series.

A large part of the county is a highly dissected plateau with strong local relief. It is covered with a mantle of silt, presumably loess, which is thickest on the tops of ridges in the southern and extreme western parts of the county. This silt is underlain by weathered siltstone, sandstone, and shale, and these, in turn, by bedrock. On the steep slopes the silt deposit is thin or absent and the underlying rocks or their weathered products are exposed. The thin soils on these slopes are classified in the Vanderburgh series, whereas the Zanesville, Hosmer, and Memphis soils occur on the ridge tops and on slopes that have a fairly thick mantle of silt. In many places the underlying rock includes some thin strata of limestone and somewhat limy shale, which outcrop here and there on steep slopes.

Large areas of soils on relatively smooth land within the rolling uplands are mapped Tilsit and Johnsburg silt loams. They are associated with the Zanesville and Hosmer soils, which occur on the more sloping areas, and with the Vanderburgh soils, which occur on the steepest slopes where the soil mantle is the shallowest. In the northern part of the county in the vicinity of Flat Creek and in the southern part of the county in the vicinity of Pigeon Creek are flat or gently undulating areas. The soils near Flat Creek are very silty, whereas those near Pigeon Creek have a higher content of clay. The many basinlike depressions throughout these flats have favored the accumulation of organic matter. Here, the water table is high and the subsoils are poorly drained, except where artificial drainage has been provided. The soils in these depressions are dark-colored and belong to the Montgomery, Ragsdale, and Zipp series. The associated light-colored soils belong to the McGary and Ayrshire series. Adjoining the Ayrshire on slightly higher land is Iona silt loam. Along the steep banks of Pigeon Creek are the Markland soils.

Contiguous to the flats in the vicinity of Pigeon Creek a nearly level river terrace extends across the southern part of the county to the extreme western part. This terrace appears to be an old flood plain of the Ohio River. The deposits are generally silty in texture, but in places nearest the river they range from loams to fine sandy loams. The soils on the highest terraces belong to the Wheeling, Sciotoville, Weinbach, and Ginat series. Although these soils are infrequently flooded, extremely high waters do cover them, as in the 1913 and 1937 floods. Considerable fresh alluvium was deposited on the lower terraces during these floods, as well as during the more frequent periods of normal high water. This condition has led to the recognition of the Woodmere and Rahm soils on the lower terraces of the Ohio River.

The smoothest areas of land occur in the bottoms of the aggraded valleys and on the Ohio River flood plain. Wide valleys of alluvial soils are interspersed with the hills. These soils are dominantly silty in texture but are underlain in places by thin layers of sand or gravel. The soils of the aggraded valleys belong chiefly to the Philo, Stendal, and Waverly series, all of which are acid in reaction. They are distinguished on the basis of reaction from the Adler and Inglefield soils, which are only slightly acid to neutral. The soils on these bottoms constitute the important farming land of the hilly districts. The most productive of the alluvial soils are the Huntington, Lindside, Melvin, and associated soils of the Ohio River flood plain. These soils are generally darker in color and heavier in texture than the alluvial soils of the aggraded valleys. They are only slightly acid to neutral in reaction. The alluvium is further characterized by the presence of very fine mica flakes.

The soils of the county are grouped into eight groups, including one group of miscellaneous land types, as follows: (1) Moderately deep silty soils developed over sandstone, siltstone, and shale; (2) shallow soils over sandstone, siltstone, and shale; (3) deep silty soils of the uplands; (4) soils developed from silts of the lake plains; (5) soils developed from slack-water clays; (6) soils of the Ohio River terraces; (7) alluvial soils; and (8) miscellaneous land types.

This grouping, as well as a general description of the soil types in each group, is presented in table 6.

TABLE 6.—*Principal characteristics of the soils of Vanderburgh Cou*

Catena [1]	Soil series	Soil type	Parent material	Topographic position	Drainage [2]	Range in slope	Slope of typical soil	Surface s
MODERATELY DEEP SILTY SOILS DEVELOPED OVER SANDSTONE, SILTSTONE, A								
						Percent	*Percent*	
Hosmer	Hosmer	Hosmer silt loam	Noncalcareous silts, to a depth of 5 to 8 feet.	Upland	IV	3 to 14	3 to 6	Light gra brown silt
Zanesville	Zanesville	Zanesville silt loam.	Noncalcareous silts, to a depth of 3 to 5 feet	Upland	IV	2 to 14	3 to 6	do
Zanesville	Tilsit	Tilsit silt loam	Noncalcareous silts, to a depth of 3 to 5 feet	Upland	III	0 to 6	0 to 3	do
Zanesville	Johnsburg	Johnsburg silt loam.	Noncalcareous silts, to a depth of 3 to 5 feet	Upland	II	0 to 3	0 to 3	Gray silt loa
SHALLOW SOILS OVER SANDSTONE, SILTSTONE, AND SHALE								
Zanesville	Vanderburgh	Vanderburgh silt loam.	Shallow silts and weathered sandstone	Upland steep slopes	VI	10 to 35	14 to 25	Grayish-bro loam from inches thi

DEEP SILTY SOILS OF THE UPLANDS

Memphis	Memphis	Memphis silt loam.	Deep silts, thickest on ridge tops; calcareous at a depth of 12 to 15 feet.	Upland	IV,VI	2 to 35	3 to 6	Grayish-brow loam.
Alford	Alford	Alford silt loam	Noncalcareous silts.		IV	3 to 14	3 to 6	do

SOILS DEVELOPED FROM SILTS OF THE LAKE PLAINS

	Iona	Iona silt loam		Lake plain flats and lower foothill slopes	III	0 to 6	0 to 3	Yellowish-gr loam to a of 8 inche derlain by ish-yellow loam 2 to 3 thick.
Princeton	Ayrshire	Ayrshire silt loam.	Deep calcareous silts.		II	0 to 3	0 to 3	Gray to brownish silt loam.
	Ragsdale	Ragsdale silt loam.		Depressional areas.	VIII	0 to 2	0 to 2	Dark-gray si to a depth to 20 inche
Markland	Zipp	Zipp silt loam			VII	0 to 2	0 to 2	Medium-gra brownish - loose silt l to 15 inche
	Peoga	Peoga silt loam			I	0 to 2	0 to 2	Light-gray lo loam 10 inches dee
Elkinsville	Lyles	Lyles silty clay loam.	Deep noncalcareous lake silts.	Lake flat	VII	0 to 2	0 to 2	Dark brov gray or gra clay loam inches dee

See footnotes at end of table.

TABLE 6.—*Principal characteristics of the soils of Vanderburgh County, In*

SOILS DEVELOPED FROM SLACK-WATER CLAYS

Catena	Soil series	Soil type	Parent material	Topographic position	Drainage	Range in slope	Slope of typical soil	Surface s
						Percent	*Percent*	
Markland	Markland	Markland silt loam	Calcareous slack-water clays of Wisconsin age	Terrace	IV	3 to 30	3 to 6	Grayish-bro loam 6 to 8 deep
	McGary	McGary silt loam.			II	0 to 3	0 to 3	Light-gra loam 8 to 9 deep
	Montgomery	Montgomery silty clay loam		Depressional areas in terrace.	VIII	0 to 3	0 to 3	Moderately gray or brownish silty clay 12 to 14 deep
	Zipp	Zipp silty clay loam			VII	0 to 3	0 to 3	Brownish silty clay 8 to 10 deep.

Wheeling	Wheeling	Wheeling silt loam.	Noncalcareous silts, clays, and sands washed chiefly from glacial drift and sandstone-shale residuum; contains mica fragments.	Terrace	IV	2 to 30	0 to 3	Grayish-bro loam 8 inches dee
		Wheeling loam			IV	0 to 6	0 to 3	Very light loam 8 to 1 es deep.
		Wheeling fine sandy loam.			V	0 to 12	0 to 3	Light-brown low fine loam 8 to 1 es deep.
	Sciotoville	Sciotoville silt loam.			III	0 to 6	0 to 3	Light gr brown sil 5 to 6 inche
	Weinbach	Weinbach silt loam.			II	0 to 3	0 to	Brownish-gr able silt l to 10 inche
	Ginat	Ginat silt loam			I	0 to 2	0 to 2	Light-gray rust-brow tled silt l to 10 inche
Woodmere	Woodmere	Woodmere silty clay loam.	Recent alluvium over old alluvium.	Low terrace	IV, III	0 to 10	0 to 3	Dark grayish silty clay 6 to 12 deep.
	Rahm	Rahm silty clay loam.			II	0 to 3	0 to 3	Dark grayish or dark bro gray silty loam 8 to 1 es deep.

See footnotes at end of table.

TABLE 6.—*Principal characteristics of the soils of Vanderburgh County, In*

ALLUVIAL SOILS

Catena	Soil series	Soil type	Parent material	Topographic position	Drainage	Range in slope	Slope of typical soil	Surface s
						Percent	*Percent*	
Huntington	Huntington	Huntington silt loam.	Alluvium derived mainly from calcareous soils; micaceous particles conspicuous.	Ohio River flood plain.	IV	0 to 6	0 to 3	Brown or grayish-b friable silt 12 to 14 deep.
		Huntington silty clay loam.			IV	0 to 10	0 to 3	Dark gra brown silt loam 15 inches dee
		Huntington fine sandy loam.			IV	0 to 3	0 to 3	Brown fine loam 15 inches dee
	Lindside	Lindside silt loam.				0 to 3	0 to 3	Dark gra brown or brownish silt loam 1 inches dee
		Lindside silty clay loam.			III	0 to 6	0 to 3	Dark gra brown or brownish silty clay l to 24 inche
	Melvin	Melvin silty clay loam.			II, I	0 to 3	0 to 3	Dark brov gray silty loam 14 inches dee
		Melvin silty clay			II, I	0 to 3	0 to 3	Dark brov gray silty to 24 inche
(²)	Boehne	Boehne silt loam.			V	0 to 6	0 to 3	Brown silt l to 24 inche
	Sandy alluvium.	Sandy alluvium.	Sand smear over Huntington or Lindside.		IV	0 to 10	0 to 3	Grayish-y loamy fin 12 to 72 deep.

Pope	Philo	Philo silt loam	Acid alluvial silts	Aggraded valley	III	0 to 3	0 to 3	Grayish-b silt loam 14 inches deep
	Stendal	Stendal silt loam.			II	0 to 2	0 to 2	Brownish-gra loam faintly tled with brown 10 inches deep
	Waverly	Waverly silt loam.			I	0 to 2	0 to 2	Light-gray loam.
(¹)	Adler	Adler silt loam	Sweet alluvial silts.		III	0 to 3	0 to 3	Grayish-brov loam 14 inches deep
	Inglefield	Inglefield silt loam.			II	0 to 2	0 to 2	Brownish-gra grayish-y silt loam f mottled rust brown 14 inches d
(³)	Algiers	Algiers silt loam	Overwash of alluvium over dark soil of depressions.		III over VIII	0 to 3	0 to 3	Grayish-yello brownish overwash loam, mode acid, 6 inches deep
	Algiers, colluvial phase.	Algiers silt loam, colluvial phase.	Local alluvium over dark-colored soil.	Alluvial-colluvial fans.	III over VIII	0 to 3	0 to 3	Grayish-yello brownish overwash loam, mode acid, 6 inches deep
(³)	Keyesport	Keyesport silt loam.	Alluvium mainly from Zanesville-Vanderburgh soils.		II	0 to 4	0 to 4	Grayish-yello light brov gray silt lo to 16 inches faintly mot
(³)	Memphis colluvial.	Memphis silt loam, colluvial phase.	Local alluvium mainly from Memphis soils.		III	0 to 4	0 to 4	Light gra brown or brown m silt loam 16 inches deep

[1] Catena means a group of soils derived from the same parent materials that differ in soil characteristics owing to difference after the best drained member of the group. Not all members of the catena necessarily occur in the county.

[2] Roman numerals refer to drainage condition in natural state: (I) Very slowly drained with very slow surface and internal d periods. Soils become very dry in dry seasons. (II) Slowly drained, with slow surface and internal drainage. Waterlogged for very dry in dry seasons. (III) Imperfectly drained, with fair external and moderately slow internal drainage. (IV) Well drai Good to rapid internal drainage. (VI) Excessive surface runoff. (VII) Slight depressions that are poorly drained owing to high is lowered. Waterlogged most of the time under natural conditions. (VIII) Shallow poorly drained depressions. Slightly deeper waterlogged under natural conditions.

[3] Catena not yet established.

The grouping of the soils for this report is made on the basis of the parent materials from which these soils are formed. Soils that are formed from the same parent material but that differ from one another in characteristics resulting from differences in natural drainage conditions or slope are spoken of as belonging to a catena, or chain, of soils. The individual members of a catena can be thought of as the links of a chain. For example, the individual soil series, or links, comprising the Wheeling catena are Wheeling, Sciotoville, Weinbach, and Ginat. The alluvial soils are placed into subgroups, as follows: (a) Slightly acid and neutral soils of the Ohio River flood plain, (b) acid silty soils of aggraded valleys, (c) slightly acid and neutral soils of aggraded valleys, and (d) soils derived from local alluvium. Within any one group or subgroup further break-downs are made on the basis of soil characteristics resulting from differences in degree of drainage that have led to the development of different soil series.

In this county, eight principal conditions of drainage were recognized, as shown in table 6. These variations in natural drainage are readily recognized by anyone working on the land. They are correlated with differences in slope, management requirements, land use capability, and productivity. Within any one drainage group the soils of all catenas resemble each other more closely than do the individual soils or links of any one catena.

Thus, the Hosmer, Zanesville, Alford, Memphis, and Wheeling soils that belong to the group of well-drained soils (drainage group IV) resemble each other in characteristics, such as color, structure, and consistence, although the parent materials are different. These soils occur on slopes ranging from gently sloping to hilly. In general the surface soils are grayish brown and the subsoils brownish yellow to yellowish brown. Other well-drained soils, covering a large total area, are members of the Markland, Woodmere, Huntington series and sandy alluvium. The last three are alluvial soils and do not show well-developed soil characteristics comparable to the soils of the uplands.

The Boehne soils have rapid internal drainage (drainage group V) owing to the sandy substratum. Wheeling loam has good internal drainage and Wheeling fine sandy loam has rapid internal drainage.

Excessive surface runoff, as occurs on the Vanderburgh soils and some of the steeper areas of Memphis soils (members of drainage group VI), is due to the steep slope.

The imperfectly drained soils with fair external drainage and moderately slow internal drainage (drainage group III) occur on nearly level to gently sloping land where surface water runs off slowly. Internal drainage is slower in the imperfectly drained soils of the uplands than in the well-drained soils because of a weak hardpan that is either silty or clayey in texture. This is also true of the Tilsit, Iona, and Sciotoville soils. The hardpan is not developed in the alluvial Lindside, Philo, and Adler soils, which are also imperfectly drained. In general, the surface soils of these soils are slightly grayer and paler or the subsoils are grayer than the corresponding layers of the well-drained soils. In places, the surface soils are light grayish brown or brownish gray and the subsoils are pale yellow and more or less mottled with gray and brown in the lower part.

The slowly and very slowly drained, intermittently wet and dry, light-colored soils (drainage group II and I) occur on flat surfaces that have slow surface and internal drainage. Water stands on the surface at different times during the year, although the soils may be very dry the rest of the year. The subsoils are more or less impervious, owing to the presence of a tight hardpan or claypan layer, that retards the downward movement of moisture and keeps the soils in a waterlogged condition for long periods at a time. The surface soils are brownish gray or light gray and the subsoils are mottled yellow, gray, or brownish gray. Concretions of iron are generally present in the upper part of the subsoil and occasionally on the surface. The soils that fall into this category are members of the Johnsburg, Ayrshire, McGary, Weinbach, Peoga, Ginat, and Rahm series. The alluvial soils—Stendal, Inglefield, Algiers, Keyesport, Waverly, and Melvin—do not have a tight layer but do have surface and subsoil colors characteristic of the group.

In their natural state the very slowly drained dark-colored soils that occur in slight depressions or basinlike areas (drainage groups VII and VIII) have a permanent high water table and are wet the greater part of the year. Under these conditions they have developed moderately dark and deep surface soils with gray more-or-less waterlogged subsoils. They are neutral to only slightly acid in reaction. The Ragsdale (drainage group VIII), Zipp, and Montgomery soils fall into this category. Most of these soils are ditched and drained at present and are among the most productive of the county.

The soils have also been combined on the basis of the dominant soils into geographical areas, and these are shown in the generalized soil map (fig. 2).

Area *A* includes mainly the Alford, Ayrshire, and Ragsdale soils, as well as the Iona, Zipp, and the alluvial soils of the narrow bottoms—Stendal, Inglefield, Algiers, and Lyles—which are too small to show in figure 2.

Area *B* represents the silty alluvial soils, local alluvial soils, and soils of the lake plains. Along Flat Pond Ditch, a tributary of Flat Creek, in the northwestern part of the county, the soil is chiefly Peoga silt loam. Immediately south of it, the area designated as *B* is likewise Peoga silt loam. Throughout the area *B*, the soil adjacent to the hillsides is mapped as Keyesport silt loam. The silty alluvial soils in the northern part of the county consist of Waverly, Stendal, and Philo soils, which are acid, and some small inclusions of Algiers and Lyles. In the southern part of the county the alluvial soils consist of Inglefield and Adler silt loams, which are neutral or only slightly acid in the upper layers.

Area *C* contains large bodies of Tilsit and Johnsburg soils and some small inclusions of Zanesville and Hosmer soils, together with alluvial soils on some narrow bottoms.

Area *D* comprises the largest total area of the county. On the ridge tops Zanesville and Hosmer soils are dominant, whereas on the slopes the Vanderburgh soils are dominant. Small areas of Tilsit, Johnsburg, and alluvial soils are included because they could not be shown on a small-scale map.

Area *E* comprises McGary, Montgomery, Zipp, and Markland soils, together with small inclusions of Ragsdale, Iona, Wheeling, Sciotoville, Weinbach, and various alluvial soils.

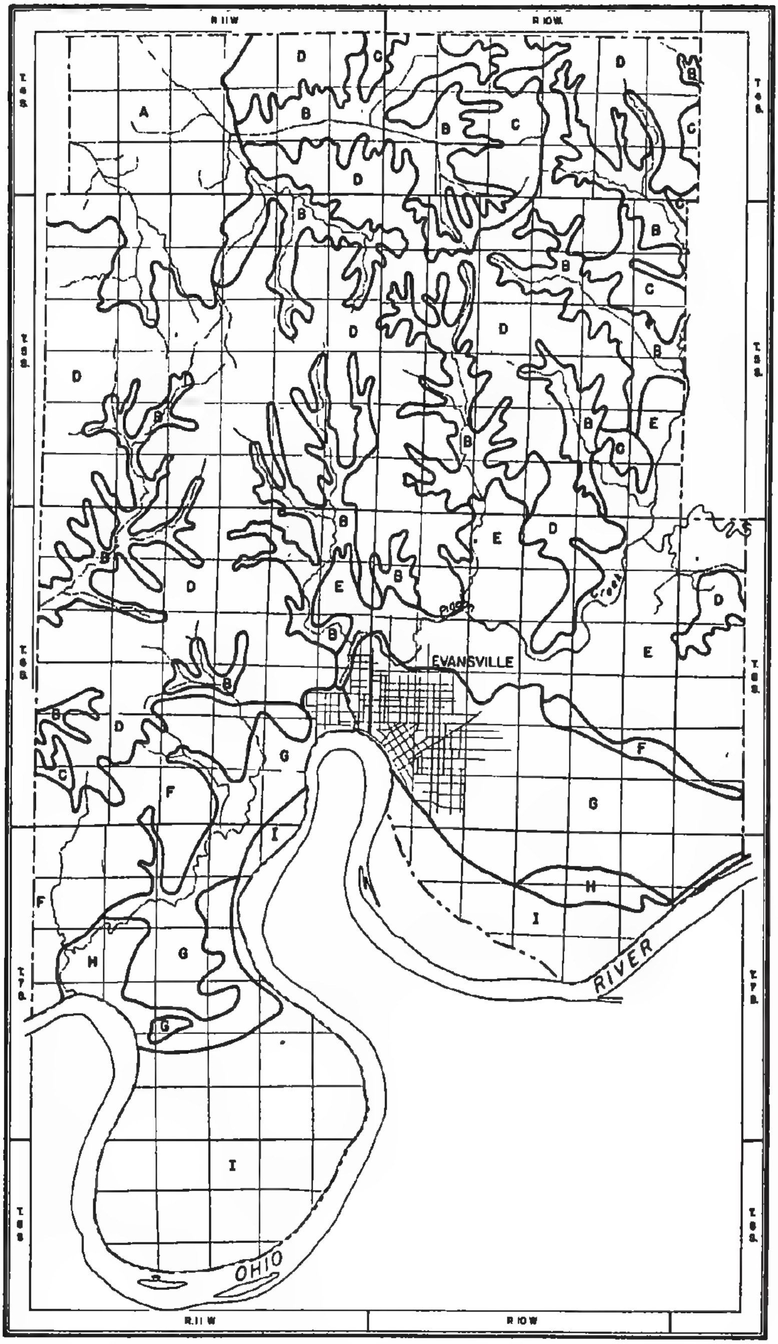


FIGURE 2.—Generalized soil map of Vanderburgh County, Ind.: *A*, Alford, Ayrshire, and Ragsdale soils; *B*, silty soils of the first bottoms and lake plains; *C*, Tilsit and Johnsburg soils; *D*, Hosmer, Zanesville, and Vanderburgh soils; *E*, McGary, Montgomery, and Zipp soils; *F*, Memphis and Vanderburgh soils; *G*, Wheeling, Sciotoville, and Weinbach soils; *H*, Woodmere and Rahm soils; *I*, Huntington, Lindside, and Melvin soils.

Area *F* covers the Memphis soils on the ridge tops and gentle slopes and Vanderburgh soils on the steep slopes. Narrow bottoms of only slightly acid or neutral alluvial soils, namely, Inglefield and Adler silt loams, are included, as well as some areas of McGary silt loam and narrow strips of Markland silt loam.

Soils of area *G* have developed from old alluvium of the Ohio River terraces. The area covers the Wheeling, Sciotoville, Weinbach, and Ginat soils.

Area *H* covers Woodmere and Rahm soils, together with small inclusions of Melvin silty clay loam, which occur in the sloughs associated with Woodmere and Rahm soils.

Area *I* comprises the soils of the Ohio River bottoms, consisting chiefly of Huntington, Lindside, and Melvin series, together with the Boehne silt loam and some undifferentiated sandy alluvium.

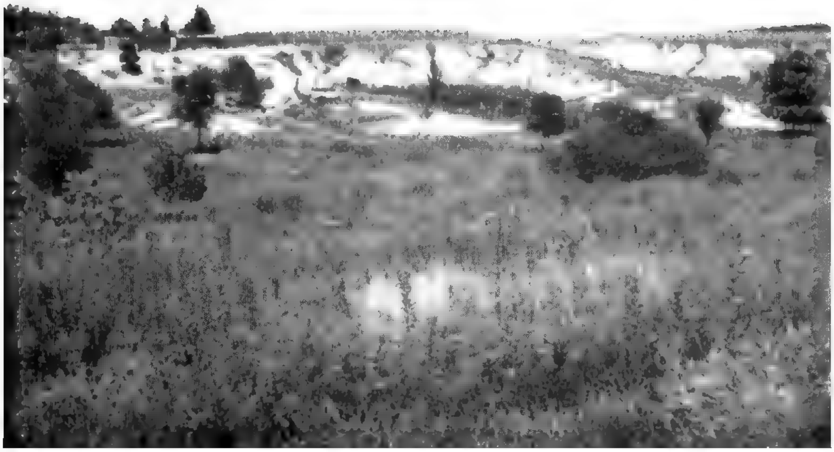
A close relationship exists between the groups of soils and the type of farming that is carried on. Actual land use, however, is modified by economic factors that account for the extending of types of farming areas over several soil-association groups. These factors are discussed in the section on Land Use and Soil Management. Generally in the hilly sections, farming is carried on in small units, because the arable land is confined chiefly to the narrow ridge tops and small valleys. Dairying is important in the eastern part of the county. Vegetables, small grains, hay, and corn are grown. Corn usually is grown on the large areas of smooth or undulating land that are adapted to intensive cultivation. Here it is the most important crop; wheat, soybeans, and hay follow in order of importance. The alluvial soils that are not inundated for long periods, excluding those of the Ohio River, are planted to corn, soybeans, wheat, and hay in rotation. The alluvial soils of the Ohio River are farmed in large units. These soils are periodically flooded, and the floodwaters often remain on the land for relatively long periods of time. Frequently the floods occur during the early spring at a time when they would harm any winter crop growing on the land. It is therefore more profitable to farm these alluvial soils to corn and soybeans. Very high yields can be obtained under favorable climatic conditions. The best practices consist of growing corn and soybeans in a 2-year rotation. According to the county agent and his assistants, turning under soybeans on the heavy-textured Huntington and Lindside soils increases corn yields. All farmers do not follow the best practices; many of them grow corn in the same place for many years. Yields are not as high under such management.

In the following pages the soils of Vanderburgh County are described in detail and their agricultural importance is discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 7.

TABLE 7.—*Acreage and proportionate extent of the soils mapped in Vanderburgh County, Ind.*[1]

Soil type	Acres	Percent
Hosmer silt loam	6,656	4.4
Hosmer silt loam, eroded phase	3,456	2.3
Hosmer silt loam, level phase	320	.2
Hosmer silt loam, slope phase	192	.1
Hosmer silt loam, eroded slope phase	2,368	1.6
Hosmer silt loam, severely eroded slope phase	576	.4
Hosmer silt loam, hill phase	128	.1
Hosmer silt loam, eroded hill phase	384	.3
Hosmer silt loam, severely eroded hill phase	832	.5
Zanesville silt loam	4,736	3.1
Zanesville silt loam, eroded phase	3,840	2.5
Zanesville silt loam, level phase	320	.2
Zanesville silt loam, slope phase	384	.3
Zanesville silt loam, eroded slope phase	4,352	2.9
Zanesville silt loam, severely eroded slope phase	2,304	1.5
Tilsit silt loam	2,368	1.6
Tilsit silt loam, eroded gentle-slope phase	1,152	.8
Johnsburg silt loam	1,792	1.2
Johnsburg silt loam, eroded phase	192	.1
Vanderburgh silt loam	3,968	2.6
Vanderburgh silt loam, eroded phase	1,536	1.0
Vanderburgh silt loam, severely eroded phase	2,624	1.7
Vanderburgh silt loam, hill phase	1,216	.8
Vanderburgh silt loam, eroded hill phase	3,008	2.0
Vanderburgh silt loam, severely eroded hill phase	3,008	2.0
Vanderburgh silt loam, very steep phase	1,472	1.0
Vanderburgh silt loam, eroded very steep phase	64	(2)
Vanderburgh silt loam, severely eroded very steep phase	64	(2)
Rough gullied land (Vanderburgh soil material)	4,416	2.9
Memphis silt loam	1,024	.7
Memphis silt loam, eroded phase	512	.3
Memphis silt loam, level phase	128	.1
Memphis silt loam, slope phase	64	(2)
Memphis silt loam, eroded slope phase	576	.4
Memphis silt loam, severely eroded slope phase	128	.1
Memphis silt loam, hill phase	192	.1
Memphis silt loam, eroded hill phase	320	.2
Memphis silt loam, severely eroded hill phase	256	.2
Memphis silt loam, steep phase	192	.1
Memphis silt loam, eroded steep phase	64	(2)
Memphis silt loam, severely eroded steep phase	192	.1
Alford silt loam	64	(2)
Alford silt loam, eroded phase	1,408	.9
Alford silt loam, level phase	64	(2)
Alford silt loam, eroded slope phase	512	.3
Alford silt loam, severely eroded slope phase	128	.1
Alford silt loam, severely eroded hill phase	64	(2)
Iona silt loam	640	.4
Iona silt loam, eroded gentle-slope phase	320	.2
Ayrshire silt loam	2,240	1.5
Peoga silt loam	2,624	1.7
Ragsdale silt loam	1,984	1.3
Zipp silt loam	1,088	.7
Lyles silty clay loam	1,024	.7
Markland silt loam, eroded phase	896	.6
Markland silt loam, severely eroded phase	64	(2)
Markland silt loam, slope phase	64	(2)
Markland silt loam, eroded slope phase	640	.4
Markland silt loam, severely eroded slope phase	192	.1
Markland silt loam, eroded steep phase	384	.3
Markland silt loam, severely eroded steep phase	512	.3
McGary silt loam	4,352	2.9
Montgomery silty clay loam	3,968	2.6
Zipp silty clay loam	2,752	1.8
Wheeling silt loam	256	.2
Wheeling silt loam, eroded gentle-slope phase	1,088	.7
Wheeling silt loam, eroded slope phase	448	.3
Wheeling silt loam, severely eroded slope phase	64	(2)
Wheeling silt loam, eroded steep phase	448	.3
Wheeling silt loam, severely eroded steep phase	128	.1
Wheeling loam	384	.3
Wheeling loam, eroded gentle-slope phase	512	.3
Wheeling fine sandy loam	256	.2
Wheeling fine sandy loam, eroded gentle-slope phase	256	.2
Wheeling fine sandy loam, eroded slope phase	64	(2)
Woodmere silty clay loam	768	.5
Woodmere silty clay loam, eroded phase	64	(2)
Woodmere silty clay loam, gentle-slope phase	576	.4
Woodmere silty clay loam, eroded gentle-slope phase	64	(2)
Woodmere silty clay loam, severely eroded gentle-slope phase	64	(2)
Sciotoville silt loam	4,480	3.0
Sciotoville silt loam, eroded gentle-slope phase	704	.5
Rahm silty clay loam	1,920	1.3
Weinbach silt loam	5,440	3.6
Ginat silt loam	1,280	.9
Huntington silt loam	1,920	1.3
Huntington silt loam, gentle-slope phase	576	.4
Huntington silty clay loam	4,352	2.9
Huntington silty clay loam, gentle-slope phase	1,600	1.1
Huntington silty clay loam, slope phase	128	.1
Huntington fine sandy loam	320	.2
Boehne silt loam	832	.5
Boehne silt loam, gentle-slope phase	384	.3
Sandy alluvium	704	.5
Lindside silt loam	704	.5
Lindside silty clay loam	4,608	3.0
Lindside silty clay loam, gentle-slope phase	704	.5
Melvin silty clay loam	2,624	1.7
Melvin silty clay	704	.5
Philo silt loam	4,224	2.8
Stendal silt loam	7,424	4.9
Waverly silt loam	1,600	1.1
Adler silt loam	1,792	1.2
Inglefield silt loam	3,520	2.3
Algiers silt loam	1,152	.8
Algiers silt loam, colluvial phase	320	.2
Keyesport silt loam	4,288	2.8
Memphis silt loam, colluvial phase	128	.1
Made land	192	.1
Borrow pits	128	.1
Riverwash	128	.1
Total	151,680	100.0

[1] Including about 4 square miles of Henderson County, Ky. [2] Less than 0.1 percent.



A, Erosion characteristic of Hosmer and Zanesville silt loams. *B*, Soybeans on Woodmere and Rahm silty clay loams. Cypress trees in background are on Melvin silty clay.

A, Area of Zanesville silt loam The woods are on steeper slopes of Zanesville and Vanderburg
loam The material above the pick is probably loess C, Small area of soil practically destroye
loam, severely eroded slope phase

MODERATELY DEEP SILTY SOILS DEVELOPED OVER SANDSTONE, SILTSTONE, AND SHALE

Moderately deep silty soils developed over sandstone, siltstone, and shale comprise the largest total area of the county. They include Hosmer, Zanesville, Tilsit, and Johnsburg silt loams. These soils are all developed from deep silts that overlie sandstone, siltstone, and shale. The Hosmer soil has the greatest range in slope, from nearly level to hilly. It occupies the tops of ridges and gentle hill slopes and is associated with the Zanesville soil. External and internal drainage are good. Practically all of the Zanesville and Hosmer soils have lost some surface soil through erosion (pl. 1, *A*). The farming land is confined to the smoother areas, which are relatively small in size.

The Tilsit soils are moderately well drained, being intermediate between the Johnsburg soils, which are imperfectly drained, and the Hosmer and Zanesville soils, which are well drained. They are typically developed on gentler slopes than are the Hosmer and Zanesville soils, slopes ranging in most places from 0 to 3 percent and in some places up to 6 percent. The Tilsit soils are differentiated from the Zanesville and Hosmer soils on the basis of a slightly grayer surface soil and a paler yellow subsoil that becomes mottled about 20 inches below the surface.

The Johnsburg soils occur on flats or lower foothill slopes where the gradient seldom exceeds 3 percent. Surface drainage here is slow, and these soils may be wet for some time during certain seasons of the year. Internal drainage is likewise impeded by the presence of a mottled gray and yellow tight layer at a depth of 16 or 18 inches. The Johnsburg soil is distinguished from the Tilsit by its grayer surface soil and subsoil. Generally the surface soil is gray and the subsoil is grayish yellow.

Practically all of the land in the group has been cleared and cultivated at some time. General farming and dairying are practiced on these soils. Corn, wheat, hay, soybeans, and vegetables are grown. The rotations most commonly used are corn, wheat, and hay. Fertilizer generally is used on wheatland but seldom on cornland. Although most of the soils in this group are acid in reaction and need lime, lime is not used extensively but only on fields where clover or alfalfa are grown.

Hosmer silt loam.—Hosmer silt loam is mapped chiefly in the southern and southwestern parts of the county along the tops of ridges. It is a transitional soil from the Memphis and Alford series to the Zanesville and is derived from wind-blown silt material. Hosmer silt loam adjoins the Memphis soil on the south, the Alford soil on the north, and the Zanesville soil largely on the east. It resembles the Alford and Memphis soils in having a very friable yellowish-brown or brownish-yellow subsoil. It differs from these soils in having a more compact lower subsoil, giving the appearance of a weak hardpan.

Typically, Hosmer silt loam is developed on slopes ranging from 3 to 6 percent, although a level phase is mapped that occurs on slopes of less than 3 percent. The soil is well drained both externally and internally. Practically all of Hosmer silt loam is cleared and cultivated. The long narrow shape of most bodies makes them un-

suited to large-scale farming operations. Small-scale general farming is of chief importance on this soil.

In plowed fields the surface soil to a depth of 8 or 10 inches is light grayish-brown silt loam. In wooded areas a thin layer of leafmold covers the surface. The subsoil to a depth ranging from 26 to 30 inches is brownish-yellow or yellowish-brown friable silty clay loam. This material breaks readily into angular aggregates, ranging from one-fourth to one-half inch in diameter. The lower part of the subsoil to a depth ranging from 30 to 36 inches is brownish-yellow silty clay loam or light silty clay loam that breaks into subangular aggregates ¾ to 1 inch in diameter. The faces of these aggregates are coated with gray colloidal material. Below this layer and reaching to a depth of 40 to 45 inches is light brownish-yellow and gray silt-streaked compact light silty clay loam. This material breaks into blocky aggregates or in some places into prismatic aggregates. It has a slight tendency to retard the downward movement of moisture. The parent material at a depth ranging from 70 to 130 inches is light brownish-yellow silt loam. Tongues of gray silt extend into this material, and numerous pinhead concretions of iron and manganese oxides occur. The substratum is grayish-yellow compact or indurated silt loam or gritty silt loam material. In places, fragments of partly weathered red and yellow sandstone are present at a lower depth. This material continues to a bedrock of sandstone or shale, which lies from 90 to 150 inches below the surface. The soil is acid throughout.

If this soil is not properly managed its silty nature subjects it to sheet erosion. Practically all of it has lost some surface soil in this manner. This loss, however, has not exceeded 50 percent, and the fertility has not been markedly reduced.

Originally Hosmer silt loam supported good stands of hardwoods. At present only a few areas are wooded and the stands are of second growth. The steeper soils of the Memphis, Zanesville, and Vanderburgh series are most heavily wooded. The tree growth on the Hosmer is the same as that on Zanesville silt loam.

Practically all of the land is cleared and cultivated to crops of corn, wheat, hay, soybeans, and vegetables. A small percentage of the total area is idle and has grown up in weeds. Corn usually yields from 30 to 50 bushels an acre, wheat 12 to 25 bushels, hay (lespedeza, timothy, and clover or timothy and redtop) from 1 to 2 tons, soybeans 15 to 25 bushels, and potatoes 150 to 200 bushels. Average acre yields are about as follows: Corn 35 bushels, wheat 18 bushels, hay 1½ tons, lespedeza 1 ton, alfalfa 2 tons, soybeans 18 bushels, and potatoes 125 bushels. Wheatland usually is fertilized with 100 to 200 pounds of 2–12–6 fertilizer. Cornland is not generally fertilized. When any fertilizer is used, the quantity ranges from 50 to 125 pounds of 0–10–10 or 0–20–20. Land devoted to vegetables and potatoes receives applications of fertilizer and manure if available. Potatoes are grown in small patches generally for home use. Much of the land needs lime inasmuch as clover does not do well. Alfalfa cannot be grown successfully without the use of lime and fertilizer. Better yields of crops than those reported can be obtained under favorable conditions with more intensive farming practices, which include using lime, heavier fertilizing, growing of clover, and the turning under of green legumes. The usual rotations

are corn, wheat, and hay, or corn, soybeans, wheat, and hay. A large part of the soybeans are cut for hay. In addition to these cultivated crops, considerable areas are used for the production of apples, peaches, raspberries, and grapes.

Hosmer silt loam, eroded phase.—This phase includes areas of Hosmer silt loam that have lost from 50 to 100 percent of the surface soil by accelerated erosion. Severely eroded areas exposing the subsoil are conspicuous in many fields (see pl. 1, *A*). Gullied fields are also included in this phase. Its total area is small. This soil differs from the typical soil principally in having a shallower surface soil. The productivity of Hosmer silt loam, eroded phase, is considerably less than that of the typical soil. Methods to control erosion must be used to check further soil losses. Furthermore, soil fertility must be built up by the liberal use of legumes, together with lime, fertilizer, and manure, if such areas are to be cultivated and made to produce good crops. The best use for some of the severely eroded areas included in this phase is pasture. This involves the planting of close-growing crops in long rotations.

Hosmer silt loam, level phase.—The level phase of Hosmer silt loam occupies slopes that do not exceed 3 percent. It is mapped in small bodies on some of the broader ridge tops, chiefly in the western and southwestern parts of the county. It differs from the typical soil, Hosmer silt loam, in that it occupies smoother slopes and is less subject to erosion. Approximately three-fourths of the total area of this soil has lost less than 25 percent of the surface soil by accelerated erosion. The farming practices are about the same, and the yields are the same or slightly better than on Hosmer silt loam, but the level soil lends itself to more intensive cultivation than does the typical soil without the danger of serious erosion. These two soils are farmed together.

Hosmer silt loam, slope phase.—The slope phase of Hosmer silt loam occurs on slopes of 6 to 10 percent, which allow free runoff of water. This soil is not seriously eroded, as most of the areas have lost only 25 to 50 percent of the surface soil. This degree of erosion has not materially affected the productivity of the soil, and the yields compare favorably with those on the normal type, yet continued cultivation without control of erosion will soon result in the loss of all of the surface soil and in the formation of gullies. Most of this phase is in woods. The total area is small, because the dominant member of this slope class is Hosmer silt loam, eroded slope phase.

Hosmer silt loam, eroded slope phase.—The eroded slope phase of Hosmer silt loam occupies slopes of 6 to 10 percent. On these slopes rapid surface runoff and erosion have removed from 50 to 75 percent of the surface soil. In addition, some areas with a few gullies to the acre are included with the phase on the map.

This soil differs from typical Hosmer silt loam in having a shallower surface soil and steeper slope. Owing to this fact and possibly also to a low moisture content, the eroded slope phase is less productive for the crops of the region than the normal soil. Corn tends to fire early in the season. The soil is better suited to close-growing crops and grasses, as these help to minimize losses from erosion. Acre yields of corn usually range from 20 to 35 bushels, wheat 10 to 20 bushels, soybeans 12 to 22 bushels, hay (lespedeza or timothy and redtop) 1 to 2

tons, and alfalfa 2 tons. It is necessary to add lime for alfalfa. Estimated average acre yields are as follows: Corn 25 bushels, wheat 14 bushels, hay 1.4 tons, alfalfa 1.8 tons, and soybeans 15 bushels. The same fertilizer practices are used as on the typical soil, and small areas are farmed in conjunction with it.

Practices to control erosion should be followed wherever practical. The use of lime, long rotations, strip cropping, and growing grasses and legumes are beneficial on eroded areas.

Hosmer silt loam, severely eroded slope phase.—The severely eroded slope phase of Hosmer silt loam includes areas that have lost most of the surface soil and have numerous gullies in each field. Continued cutting of these gullies could be checked in most cases by building simple check dams and by diverting the water away from them. Included are a few areas that have deep V-shaped gullies embedded in bedrock. These gullies cannot be crossed by heavy farm machinery.

This soil is not suited for continuous regular cultivation but may be used for permanent pasture, which involves only occasional plowing. The fertility of this soil will need to be built up by the use of lime, manure, and fertilizer before vigorous stands of grasses or other pasture plants can be obtained. The few areas with deep gullies are probably best suited for forestry.

Hosmer silt loam, hill phase.—The hill phase of Hosmer silt loam is inextensive. It occupies short slopes of 10 to 14 percent, which allow rapid runoff. Little or no surface soil has been lost by accelerated erosion because most of the areas are in woods. This soil is not suitable for continuous cultivation because of its susceptibility to severe sheet erosion and gullying when cleared. The present woods offer good protection to the land.

Hosmer silt loam, eroded hill phase.—The eroded hill phase of Hosmer silt loam occupies slopes of 10 to 14 percent, which have lost from 50 to 75 percent of the surface soil. In addition, gullies are common on some of the areas. This soil is not very extensive, because most of the hill phase is subject to severe erosion if continuously cultivated. Weathered bedrock in most places is within 4 feet of the surface.

The eroded hill phase of Hosmer silt loam is similar to the typical soil as regards the chemical and physical properties of the surface soil and subsoil, but it differs from that soil in being shallower to bedrock. Recommended uses are the same as those discussed under Hosmer silt loam, severely eroded hill phase.

Hosmer silt loam, severely eroded hill phase.—Hosmer silt loam, severely eroded hill phase, is the dominant member of the Hosmer series occurring on slopes ranging from 10 to 14 percent. In most places this soil occupies the lower short slopes of areas dominated by the Hosmer soils, and it is cultivated in conjunction with the adjoining areas of Hosmer soils. Owing to rapid runoff, most of this soil is severely eroded, having lost from 75 to 100 percent of the surface soil. Gullies are a prominent feature of this landscape.

The severely eroded hill phase of Hosmer silt loam is similar to the typical soil as regards color and sequence of soil layers, differs from it in that it is shallower to bedrock, because practically all of the sur-

face soil is gone and because the intervening soil layers are somewhat thinner.

This soil is not suitable for continuous cultivation because of its steep slope and severely eroded conditions. It is better adapted to the growing of grasses and legumes to provide permanent pasture. Occasional cultivation may be permitted to renew the stands of permanent pasture. In its present condition this soil is low in fertility, but lespedeza seems to do well. Use of lime, manure, and fertilizer would aid greatly in obtaining good stands of desirable grasses and legumes. Some mechanical measures for checking gullying are desirable in severely gullied fields. At present much of this soil is in continuous cultivation, being grown to wheat and hay. Yields of wheat are low, averaging about 8 bushels an acre with the use of 100 to 125 pounds of 2-12-6 fertilizer. The yields range from 8 to 14 bushels an acre. Hay yields from ¾ to 1 ton an acre. Hay consists chiefly of lespedeza, although timothy and redtop and timothy and red clover are also grown. Yields of alfalfa average 1.2 tons an acre after the use of lime and fertilizer.

Zanesville silt loam.—Zanesville silt loam is mapped chiefly in the northern, central, and eastern parts of the county along the tops of ridges. It adjoins the Hosmer soil, which occurs immediately west and south of it. Throughout the central and northeastern parts of the county the Zanesville soil is associated with the Vanderburgh soil, which occupies the steepest and shallowest slopes.

Zanesville silt loam is typically developed on slopes ranging from 3 to 6 percent (pl. 2, *A* and *B*). Steeper slopes have been designated as slope phases. The soil is well drained both externally and internally. Practically all of Zanesville silt loam is cleared and cultivated. It generally occurs in long narrow bodies, which makes it unsuited to large-scale farming operations. General farming and dairying are important in the eastern part of the county.

In plowed fields the surface soil to a depth of 8 to 10 inches is light grayish-brown silt loam. In wooded areas, a thin layer of leafmold is present, and the surface soil in places has a slightly darker color owing to the presence of organic matter. The subsoil to a depth ranging from 22 to 30 inches is brownish-yellow friable silty clay loam, which in places is slightly streaked with grayish yellow in the lower part. This material breaks readily into angular aggregates ranging in size from one-fourth to one-half inch. The subsoil is underlain to a depth ranging from 36 to 40 inches by light brownish-yellow heavy compact silt loam. This material is streaked with gray or yellowish-gray silt and breaks readily into coarse angular aggregates, from 1 to 6 inches across. This layer tends to retard slightly the downward movement of moisture. It is underlain to a depth ranging from 48 to 60 inches by light brownish-yellow silt loam material that is streaked with tongues of gray silt. Below this depth and extending to bedrock is grayish-yellow compact or indurated silt loam or gritty silt loam material. Bedrock of sandstone and shale occurs at a depth ranging from 72 to 100 inches. The soil is acid throughout.

Zanesville silt loam has a fairly friable subsoil that allows ready penetration of plant roots. Downward percolation of waters, however, is slightly impeded by the presence of a tight layer or silt pan beneath the subsoil.

Zanesville silt loam is subject to rapid sheet erosion when not properly managed. Practically all of it has lost some of its surface soil in this manner. This loss has not exceeded 50 percent, however, and the productivity has not been markedly reduced.

Originally, Zanesville silt loam supported good stands of hardwoods. At present only a few virgin stands are left, but most of the wooded areas are in second-growth timber. These are generally confined to the steeper slopes. Some of the present tree growth on the Zanesville soil includes eastern red oak, white oak, southern red oak or Spanish oak, black oak, pignut hickory, shellbark hickory, black locust, honeylocust, sassafras, flowering dogwood, mulberry, white ash, redbud, ironwood, persimmon, tuliptree, sugar maple, black maple, dog hackberry, linden, American beech, and black tupelo (black gum).

Practically all of this soil is cleared and devoted to corn, wheat, hay, soybeans, and vegetables. A small percentage of the total area is idle and has grown up in weeds. Corn usually yields from 25 to 45 bushels an acre, wheat 12 to 20 bushels, hay (lespedeza, timothy, and clover or timothy and redtop) from ¾ to 2 tons, soybeans 14 to 22 bushels, and potatoes 100 to 150 bushels. Estimated average acre yields are: Corn 30 bushels, wheat 16 bushels, hay 1½ tons, lespedeza 1 ton, alfalfa 1½ tons, soybeans 16 bushels, and potatoes 100 bushels. Wheatland is usually fertilized with 100 to 200 pounds of 2–12–6 fertilizer. Cornland is not generally fertilized. When fertilizer is used, the quantity ranges from 50 to 125 pounds of 0–10–10 or 0–20–20. Land devoted to vegetables and potatoes receives application of fertilizer and manure if available. Potatoes are grown in small patches generally for home use. Only a small total acreage of this soil has been limed, although much of the land is in need of lime, inasmuch as clover does not do well without it. Alfalfa cannot be grown successfully without the use of lime and fertilizer. Better yields than those reported can be obtained under favorable conditions with more intensive farming practices, which include the use of lime and more fertilizer, growing of clover, and the turning under of legumes. The usual rotations are corn, wheat, and hay or corn, soybeans, wheat, and hay. A large part of the soybean crop is cut for hay in the dairy section of the county. In addition to these cultivated crops, apples, peaches, raspberries, and grapes are grown in large areas.

Zanesville silt loam, eroded phase.—The eroded phase of Zanesville silt loam includes areas that have lost from 50 to 100 percent of the surface soil by accelerated erosion. Severely eroded areas exposing the subsoil are conspicuous in many fields (see pl. 1, *A*). Gullied fields are also included in this phase. It has a small total extent. This soil differs from the typical soil principally in having a shallower surface soil. The productivity of Zanesville silt loam, eroded phase, is considerably less than that of the typical soil. Methods to control erosion must be used to check further soil losses. Furthermore, it becomes necessary to build up the soil fertility by the liberal growing of legumes and use of lime, fertilizer, and manure, if such areas are to be cultivated and made to produce good crops. The best use for some of the severely eroded areas is pasture. This involves planting close-growing crops in long rotations.

Zanesville silt loam, level phase.—The level phase of Zanesville silt loam occupies slopes that do not exceed 3 percent. It is mapped in small bodies on some of the broader ridge tops chiefly in the northern and central parts of the county. It differs from the typical soil in that it occupies smoother slopes and is less subject to erosion. Approximately three-fourths of the total area of this soil has lost less than 25 percent of its surface soil by accelerated erosion. The yields and farming practices are about the same or slightly better than on the typical soil; however, it lends itself to more intensive cultivation.

Zanesville silt loam, slope phase.—The slope phase of Zanesville silt loam is not very extensive, because most of this soil has become so eroded that it is classed as an eroded slope phase. It occurs throughout the county in association with the other Zanesville and Hosmer soils occupying slopes ranging from 6 to 10 percent. Most of this soil is in woods or has been cleared relatively recently. It includes areas that are uneroded and also those that show only a slight degree of erosion. Gullies are uncommon. In most places the loss of surface soil has been less than 50 percent, which probably has not appreciably decreased the fertility of the soil. This soil is subject to serious erosion if continuously cultivated to row crops. The management practices recommended for Zanesville silt loam, eroded slope phase, would apply here. Although in its present state the yields may be slightly higher than on Zanesville silt loam, eroded slope phase, they would under continuous cropping come down to the same level.

This soil is similar to the typical soil in color and in nature of its parent material. It differs from the typical soil in that it is shallower to bedrock, exceeding 7 feet in few places, and has a mottled or grayish-yellow streaked tight layer occurring closer to the surface, at a depth ranging from 16 to 20 inches. This tight layer hinders the percolation of water, and the roots of some plants penetrate it only with difficulty.

The surface soil in newly cleared areas is light grayish-brown silt loam, 7 or 8 inches deep. The subsoil to a depth of 16 to 20 inches is brownish-yellow friable heavy silt loam to silty clay loam that breaks readily into subangular fragments one-fourth to one-half inch in diameter. It is underlain to a depth of 22 to 28 inches by a tight layer of brownish-yellow heavy silt loam or silty clay loam streaked and mottled with gray. This layer in turn is underlain to bedrock by light brownish-yellow compact silt loam material that is streaked with bands and tongues of light-gray or grayish-yellow silt. Throughout this layer are numerous small concretions of iron. Bedrock of sandstone, siltstone, and shale occurs at a depth ranging from 6 to 8 feet.

This soil, when cleared, is planted to crops of corn, wheat, hay, and soybeans. Yields of crops particularly of corn, are slightly lower than on typical Zanesville silt loam. Corn yields from 15 to 30 bushels, wheat 10 to 18 bushels, soybeans 14 to 20 bushels, and hay 1 to 1½ tons an acre. Corn is estimated to yield an average of about 25 bushels, wheat 12 bushels, soybeans 15 bushels, and hay 1.2 tons and timothy and clover 1.3 tons an acre. These yields are obtained under management that includes the fertilizing of land devoted to

wheat in a rotation of corn, wheat, and hay or one of corn, soybeans, wheat, and hay. Wheatland commonly receives 100 to 200 pounds of 2-12-6 fertilizer. Where manure is available, a top dressing on wheat in the winter is beneficial. Much of the soybean crop is cut for hay. Lespedeza is the important hay crop, although timothy and redtop and timothy and clover are also grown.

Most of the land is acid in reaction and needs lime for red clover and alfalfa. This would aid in the establishment of clover, which would tend to build up the soil. Turning under of green manures and clover would no doubt increase the yields of crops that follow. Measures for control of erosion, such as plowing on the contour, strip cropping, and the growing of winter cover crops, should be used wherever practicable.

Zanesville silt loam, eroded slope phase.—Zanesville silt loam, eroded slope phase, is most extensive in the north-central and northeastern parts of the county. It is associated with Zanesville silt loam and also adjoins the Vanderburgh soils, which are mapped on steeper slopes. It occurs in a section that is largely devoted to dairying. This soil occupies slopes ranging from 6 to 10 percent which allow free to rapid runoff. In its present condition 50 to 75 percent of the surface has been lost by sheet erosion. All fields, however, do not exhibit a uniform blanket type of erosion. In some spots the soil is less eroded than the soil described, and in others erosion has exposed the subsoil. In addition, a few gullies an acre are common in many fields. Most of these gullies are relatively shallow, although a few that cannot be crossed by heavy farm machinery are included in this phase, owing to their small extent. Practically all of this soil is cleared and has been recently cultivated. However, a number of fields were lying idle at the time the map was made.

Because of the eroded condition of this soil, the surface is shallower and the depth to bedrock is less than on Zanesville silt loam, slope phase. This fact and possibly also the lower moisture content tend to make this soil less productive for the crops grown than is the slope phase. However most of the eroded slope phase is cultivated to crops of corn, wheat, hay, and soybeans. Acre yields of corn usually range from 15 to 30 bushels, with an estimated average yield of 20 bushels; wheat 10 to 18 bushels, with an estimated average of 12 bushels; soybeans 14 to 20 bushels, with an estimated average of 15 bushels; and hay (lespedeza or timothy and redtop) ¾ to 1½ tons, with an estimated average of 0.8 ton for lespedeza and 1 ton for timothy and redtop. These yields are obtained under management that includes the fertilizing of land devoted to wheat in a rotation of corn, wheat, and hay, or a rotation of corn, soybeans, wheat, and hay. Wheatland commonly receives 100 to 200 pounds of 2-12-6 fertilizer. Where manure is available, a top dressing on wheat in the winter is beneficial. Much of the soybean crop is cut for hay. Lespedeza is the important hay crop, although timothy and redtop and timothy and clover are also grown. In the northern part of the county many apple and peach orchards are established on this soil.

Most of this land is strongly acid in reaction and needs lime for red clover and alfalfa. Turning under of green manures and clover would no doubt increase the yields of crops that follow. Measures for control of erosion, such as plowing on the contour, strip cropping, and

the growing of winter cover crops, should be taken wherever practicable. In some places terracing may be necessary to prevent further losses from erosion.

Zanesville silt loam, severely eroded slope phase.—The severely eroded slope phase of Zanesville silt loam includes areas that have lost from 75 to 100 percent of the surface soil and have many gullies to the acre. Some of the gullies are relatively shallow and short; others are deep and have cut their way into bedrock (pl. 2, *C*). The latter type cannot be crossed by heavy farm machinery. This soil occupies slopes ranging from 6 to 10 percent. It is similar to the Zanesville silt loam, eroded slope phase, but has lost most of its surface soil and some of its subsoil. This loss has markedly reduced its productivity. In its present condition, it is not adapted to continuous cultivation but would be better suited to permanent pasture. Lespedeza makes a ready growth on these eroded soils and should be used in order to decrease losses from erosion. Other thick-growing crops may also be used, although it may be more difficult to obtain satisfactory growth. Many fields require intensive mechanical measures to control gullying.

Tilsit silt loam.—Tilsit silt loam occurs in association with Zanesville and Hosmer soils on broad very gently sloping ridge tops or lower gentle foot slopes. The largest bodies are in the northern and northeastern parts of the county, which is chiefly a dairy section. It occupies slopes ranging from 0 to 3 percent. Runoff is slow, and internal drainage is somewhat impeded by the presence of a tight layer at a depth of 20 or 22 inches. Practically all of this soil is cleared and cultivated to corn, wheat, and hay. Hay consists of lespedeza, soybeans, and timothy with redtop. Corn, wheat, and hay occupy approximately equal acreages. The original tree growth on this soil was the same as that on Zanesville silt loam.

In cultivated fields the surface soil of Tilsit silt loam to a depth of 10 inches is light grayish-brown or brownish-gray mellow silt loam. In wooded areas the surface soil is slightly darker, owing to the higher content of organic matter intermixed with the mineral soil. The subsoil to a depth of 20 or 22 inches is pale-yellow compact heavy silt loam having numerous black and brown concretions about the size of a pinhead. It breaks readily into subangular fragments one-fourth to one-half inch in size. When moist this horizon is friable to mellow. It is underlain to a depth of 28 or 30 inches by mottled gray and brownish-yellow silty clay loam. This is a tight layer that tends to retard the penetration of plant roots and the downward percolation of water. Below this layer and continuing to bedrock is a rust-brown, gray, and yellow mottled silt loam material having a marbled appearance. Tongues of light-gray silt are conspicuous in this layer. These are probably old tree-root channels that have become filled with soil from upper layers. When this layer is dry, it is hard and appears to be an indurated mass. Bedrock of sandstone and shale occurs at a depth ranging from 8 to 12 feet. The soil is strongly acid throughout.

Practically all of this soil has lost some of the surface soil through erosion, although these losses in few places exceed 25 percent. A few areas with greater erosion, however, are included in this type

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because of their small total acreage. Gullies are uncommon on typical Tilsit silt loam. Most of this soil is cleared and devoted to corn, wheat, hay, and soybeans. Yields of corn range from 30 to 40 bushels an acre without fertilizer and average about 35 bushels; yields of wheat range from 12 to 25 bushels and average about 18 bushels. Wheatland is commonly fertilized with 125 pounds of 2–12–6 fertilizer. Barley yields from 25 to 30 bushels an acre when the land is fertilized the same as wheatland; soybeans, 12 to 20 bushels an acre and average 16 bushels; potatoes, 100 to 150 bushels an acre when fertilizer is used. Acre yields of hay range from 1 to 2 tons with an average of about 1.3 tons; red clover averages 1½ tons if the land has been limed. Higher yields of corn may be obtained if the cornland is fertilized or manured. Some farmers use 80 to 100 pounds of 0–12–12 or 2–12–6 fertilizer on cornland. Where manure is available, it replaces some of the fertilizer. The usual rotations are corn, wheat, and hay or corn, soybeans, wheat, and hay. This soil needs lime; consequently very little red clover or alfalfa is grown.

Control of erosion is not a serious problem on most of this soil. Use of the above-mentioned rotations plus a winter cover crop tends to minimize soil losses by washing.

Tilsit silt loam, eroded gentle-slope phase.—Tilsit silt loam, eroded gentle-slope phase, occupies slopes ranging from 3 to 6 percent and is associated with typical Tilsit silt loam. Runoff is slightly more rapid on these slopes than on the less steep areas of Tilsit silt loam. Greater runoff combined with improper cultivation practices have probably been responsible for the more eroded condition of this soil. Erosion has removed from 25 to 50 percent of the surface soil, although areas of a less eroded soil are included. A few shallow gullies occur.

Most of this soil is in cultivation and planted to the same crops as Tilsit silt loam. Crop yields are slightly lower under the same management practices. Average acre yields are as follows: Corn 30 bushels, when fertilizer is used; wheat 16 bushels; barley 25 bushels, when 125 pounds of 2–12–6 fertilizer is used; soybeans 15 bushels; and hay 1 ton.

The biggest problem on this soil is the building up of soil fertility, which was rather low to begin with and has been diminished by long cultivation and erosion. The land is in need of lime and organic matter. More clover should be grown, and legumes should be turned under as green manures. The use of high-phosphate fertilizers or manure on cornland will increase the yields of corn as well as those of the subsequent crops, particularly hay. Such improved management practices will likewise aid in keeping erosion losses at a minimum.

Johnsburg silt loam.—Johnsburg silt loam occurs on broad flat ridge tops and lower nearly level foot slopes associated with the Tilsit and Zanesville soils. The largest areas are mapped northeast of Inglefield along United States Highway No. 41 extending north to the Vanderburgh-Gibson County line. Other large areas occur in the vicinity of Daylight and north of Elliott. The largest bodies of Johnsburg silt loam occur at the heads of streams on broad flat benches

that resemble old river terraces. East of Stacer these benches occur at the head of an old lake plain. Here Johnsburg silt loam is associated with Peoga silt loam, which is developed on the old lake plain. The construction of ditches across this old lake plain has greatly aided in the surface drainage of Johnsburg silt loam, as, in its natural state, this soil is poorly drained and wet for long periods during the rainy season. This soil has poor internal drainage, owing to the presence of a claypan in the lower part of the subsoil. Tile drains, where used, have improved this condition.

Most of this soil is in cultivation except for a few areas in woods. It is the most important soil for crops in the dairy section of the county and can produce all the crops grown in the county.

The 7- or 8-inch surface soil of Johnsburg silt loam is light-gray loose silt loam. It is underlain to a depth of 11 or 12 inches by light grayish-yellow silt loam. The subsoil to a depth of 16 or 18 inches is light grayish-yellow friable heavy silt loam containing numerous concretions of iron the size of a pinhead. This material is underlain at a depth of about 30 inches by a tight layer of gray and yellow mottled silty clay loam containing numerous dark concretions of iron. The material in this layer breaks out into coarse blocky fragments ranging in size from 1 to 2 inches. It gives way at a depth ranging from 70 to 80 inches to rust-brown and gray mottled silt loam material, containing numerous dark concretions of iron or manganese. The reticulate mottling gives this layer a marbled appearance. Below this layer and reaching to bedrock is grayish-yellow silt loam material, containing numerous dark concretions of iron or manganese oxides. Bedrock of shale or sandstone occurs at a depth ranging from 9 to 13 feet. The soil is medium acid in the surface soil and subsoil. In places the lower part of the soil is only slightly acid to nearly neutral in reaction, probably caused, particularly at the head of the old lake plain east of Stacer, by the presence of underlying limestone and calcareous shale, which belong to the Somerville formation of Carboniferous age, according to the geologic map (*6*).

Included in this type because of small extent are a few areas in which the surface soil and subsoil are much grayer than the corresponding layers of the typical soil. On this included soil, erosion is not a problem. Most of the areas of Johnsburg silt loam have lost little or no surface soil by erosion, but a few areas are included that have lost as much as 25 percent of the original surface soil. At the base of some steep upland slopes the Johnsburg soil has a slight colluvial deposit on the surface. These areas were not extensive enough to show separately on the map.

Originally, the tree growth on this soil was that characteristic of the less well-drained soils. The present tree growth consists of black oak, sweetgum, American elm, winged elm, redbud, shellbark hickory, post oak, white oak, pin oak, persimmon, catalpa, and sassafras. Most of the land, however, is cleared and in cultivation. This soil is slightly colder than the related Tilsit soil. It cannot be worked as early in the spring as the better drained soils.

Corn, wheat, soybeans, and hay are the principal crops. The largest acreage is devoted to corn. Acre yields on drained areas are as follows: Corn 30 to 50 bushels, with an average of about 35 bushels; wheat 14 to 25 bushels, with an average of about 18 bushels; oats 20

to 30 bushels; hay 1 to 2 tons, with an average of about 1½ tons; soybeans 15 to 30 bushels, with an average of about 20 bushels; potatoes an average of about 120 bushels. Cornland receives little or no fertilizer but occasionally is manured. The higher yields usually follow the use of manure or some fertilizer. Land devoted to wheat and oats commonly receives 125 pounds of 2–12–6 fertilizer. Soybeans, as well as some cowpeas, are grown both for hay and seed. Where the land has been limed, good stands of clover are obtained. Most of the hay, however, consists of lespedeza, timothy and redtop, or timothy and clover. The rotations are the same as on the Tilsit and Zanesville soils—corn, wheat, and hay, or corn, soybeans, wheat, and hay.

Johnsburg silt loam, eroded phase.—Johnsburg silt loam, eroded phase, includes principally areas that have lost from 25 to 50 percent of the surface soil through sheet erosion. In a few small areas losses of surface soil exceed 50 percent, and a few fields have some shallow gullies. This degree of erosion has not seriously impaired the productivity of the soil, but greater care should be exercised in management to prevent further soil losses. The few gullies can be readily stabilized by close-growing vegetative crops. Yields are but little less than those on typical Johnsburg silt loam, with which it is associated.

SHALLOW SOILS OVER SANDSTONE, SILTSTONE, AND SHALE

The shallow soils over sandstone, siltstone, and shale, which belong to the Vanderburgh series, are differentiated from the soils in the previous group by the shallowness of the silt overlying residual material. The Vanderburgh soils are extensive throughout the hilly and steep sections of the county associated with the Zanesville, Hosmer, and Memphis soils. They generally occur on steeper slopes than the Zanesville and Hosmer soils and, for this reason, are not suitable for continuous cultivation. Some of the less eroded areas may be adapted for permanent pasture, but most of the land is suited only for forestry. Rapid runoff of water on cleared areas has resulted in serious sheet erosion and gullying.

Most of the forested areas of the county occur on the Vanderburgh soils. Originally, these soils supported a luxuriant growth of hardwoods, but most of these stands have long since been removed. The present tree growth includes Eastern red oak, white oak, pin oak, southern red oak or Spanish oak, black oak, blackjack oak, pignut hickory, shellbark hickory, black locust, honeylocust, sassafras, flowering dogwood, mulberry, white ash, redbud, ironwood, sugar maple, black maple, black walnut, white walnut, linden, and black tupelo (black gum).

Vanderburgh silt loam.—Vanderburgh silt loam is mapped extensively throughout the hilly section of the county on slopes ranging from 14 to 25 percent. Runoff on these slopes is very rapid, so that much surface soil is lost where it is not protected. As most of this type is in woods, erosion has not been excessive. With the exception of a few areas, most of the soil here included has lost less than 25 percent of the surface layer.

The surface soil of Vanderburgh silt loam is grayish-brown mellow silt loam, 4 or 6 inches thick. In some wooded areas the surface soil is slightly darker because of higher organic-matter content. The subsoil, to depths of 8 or 10 inches, is brownish-yellow friable heavy silt loam or light silty clay loam. It is underlain to a depth of 14 or 16 inches by a tight layer of light brownish-yellow heavy silt loam that is streaked and mottled with gray silt. This material breaks into large blocky fragments from 2 to 6 inches in diameter. The underlying layer to a depth ranging from 24 to 30 inches is light brownish-yellow compact silt loam material that is streaked with bands and tongues of light-gray silt. In many places this horizon has a gritty feel, owing to the influence of the underlying sandstone. It is underlain in places by a thin layer of partly disintegrated red and yellow sandstone, which overlies bedrock of sandstone, or in other places by a variegated clay material overlying shales and siltstone. Bedrock of sandstone and shale lies at a depth ranging from 20 to 48 inches. The depth to bedrock varies with the location on the slope: near the top of the slopes the depth is greatest; and near the foot the depth generally is less than 30 inches, and in a few places less than 16 inches. In many places where the underlying bedrock is siltstone or shale of neutral reaction there is a transition layer beneath the blocky layer in which the material is light-red or light brownish-red stiff silty clay loam with a slightly acid to neutral reaction. Sandstone or limestone outcrops here and there in deep ravines, as is indicated on the map by rock-outcrop symbols. These shallow soils, the total area of which is very small, were included in this type because of the scale limitations in publishing such maps.

Vanderburgh silt loam is mostly in woodland, which is probably the best use for it because of its susceptibility to erosion. However, it can be used for permanent pasture under proper management.

Vanderburgh silt loam, eroded phase.—The eroded phase of Vanderburgh silt loam differs from the typical soil principally in being more highly eroded. It includes areas that have lost from 25 to 75 percent of the surface soil and some that have shallow or deep gullies.

Some areas of this soil are cleared, although they are not frequently cultivated. A great many are now in timber or are lying idle and are partly covered with weeds and brush. A few areas are maintained in permanent pastures of lespedeza, timothy and clover, or alfalfa. In order to obtain stands of clover and alfalfa, applications of lime and superphosphate fertilizer are necessary.

Vanderburgh silt loam, severely eroded phase.—Vanderburgh silt loam, severely eroded phase, is similar to the typical soil except that it has lost from 75 to 100 percent of the surface soil by erosion and gullies occur in nearly every field. Improper management practices involving frequent seeding to cultivated crops has been conducive to erosion.

All of these areas are cleared, but not many of them are cultivated at present. Many of the fields are lying idle and are partly covered by weeds and brush. This soil can be used for permanent pasture or timber. Some pasture plants, such as lespedeza, take root readily even on this eroded soil. Where good pastures are needed, it is desirable to increase the fertility of this soil by the use of manures and

fertilizers. If lime is used in conjunction with the fertilizers, it is possible to obtain stands of clover and heavy stands of other pasture plants.

Vanderburgh silt loam, hill phase.—Vanderburgh silt loam, hill phase, is associated with typical Vanderburgh silt loam but occurs on gentler slopes with a gradient ranging from 10 to 14 percent. In other features it is similar to Vanderburgh silt loam. It occupies a small total area, and much of it is in woodland. In most places less than 25 percent of the surface soil has been lost by erosion, although a few included areas have surface losses ranging up to 50 percent. This soil is not suitable for continuous cultivation because of its susceptibility to erosion. The same uses are recommended as for Vanderburgh silt loam, severely eroded phase.

Vanderburgh silt loam, eroded hill phase.—The eroded hill phase of Vanderburgh silt loam occurring on slopes of 10 to 14 percent is similar to the hill phase, except that it has lost more of its surface soil through erosion. The losses range from 50 to 100 percent. In addition, most fields contain some shallow gullies. Practically all of this land is cleared and was cultivated at one time. This soil generally occupies short steep slopes adjoining Zanesville silt loam. It is not suitable for continuous cultivation, but it can be used for permanent pasture. The management problems are the same as for Vanderburgh silt loam, severely eroded hill phase, except that erosion can be controlled more easily.

Vanderburgh silt loam, severely eroded hill phase.—The severely eroded hill phase of Vanderburgh silt loam occurs on slopes ranging from 10 to 14 percent and is the most extensive soil in this slope class. It occupies short steep slopes adjacent to Zanesville silt loam. It is similar to Vanderburgh silt loam, hill phase, except that it has lost more of its surface soil through erosion. Losses of surface soil range from 75 to 100 percent. In addition, many shallow and deep gullies have formed in most areas.

All of this soil is cleared and was cultivated at one time. Owing to serious erosion, many fields have been abandoned and are now grown up in weeds and brush.

This soil is not suitable for continuous cultivation, owing to its susceptibility to erosion and to its present eroded condition. It can be used, however, for permanent pasture and cultivated occasionally in order to renew the stands of pasture plants. It is desirable to have a cover crop, in order to reduce further soil losses. Lespedeza appears to take root very readily. The soil in its present condition is low in fertility. Use of lime, manure, and fertilizer would greatly encourage good stands of desirable grasses and legumes.

Regardless of the adaptabilities of this soil, many areas are still cultivated to crops of corn, wheat, and soybeans whenever these areas are parts of larger fields of Zanesville silt loam. Yields are very low.

Some mechanical measures for checking gully formation are desirable where the gullies are still actively cutting. Sodding gullies to thick close-growing grasses or legumes will aid greatly in stabilizing them.

Vanderburgh silt loam, very steep phase.—Vanderburgh silt loam, very steep phase, occupies slopes that are steeper than 25 per-

cent. Runoff from such areas is excessive. The soil is similar to Vanderburgh silt loam of less steep areas, except that depth to bedrock ranges from about 16 inches near the foot of the slope to 30 inches near the top of the slope. On the steep lower foot slopes the soils appear to be slightly different from the typical Vanderburgh silt loam, inasmuch as they lack the tight layer and the subsoil lies directly over partly disintegrated sandstone and shale. Where erosion has been severe, platy fragments of sandstone are on the surface. Deep ravines contain a few rock outcrops. Because the total acreage of these soils is small, they are included with Vanderburgh silt loam, very steep phase.

Most of Vanderburgh silt loam, very steep phase, always has been wooded so that the surface has been protected from erosion. Some wooded areas that were formerly in cultivation or heavily pastured, however, do show soil losses from erosion. These losses in most places are less than 50 percent of the surface soil. This soil is too steep for cultivated crops and should be left in timber.

Vanderburgh silt loam, eroded very steep phase.—Vanderburgh silt loam, eroded very steep phase, occupies slopes that are steeper than 25 percent. It differs from the very steep phase only in the greater degree of surface erosion. It includes areas that have lost from 50 to 75 percent of the surface soil and contains a few occasional gullies here and there. Most of this type is in woods or permanent pasture. It is too steep for agriculture and should be left in timber.

Vanderburgh silt loam, severely eroded very steep phase.—This soil occupies slopes that are steeper than 25 percent. It has lost from 75 to 100 percent of the surface soil and is severely gullied. It has a small total acreage occurring in narrow bands at the bases of slopes or at the heads of small streams. Most of these areas are no longer cultivated but are lying idle or grown up in woods. This soil is not suitable for cultivated crops.

Rough gullied land (Vanderburgh soil material).—Rough gullied land (Vanderburgh soil material) includes areas that are too severely eroded to be economically reclaimed for ordinary agriculture. Gullies are numerous and entrenched in the hard bedrock. The intergully areas have lost all or much of the surface soil. In places, part of the subsoil has been lost leaving a truncated soil profile. Fragments of sandstone, siltstone, and shale are numerous in the gullies. Vertical cutting has removed the surface soil and subsoil down to the underlying rock. Where erosion is not checked, the gullies cut their way back into the adjacent less eroded soils. This type of erosion is characteristic of unprotected areas at the heads of small streams and on slopes with gradients greater than 6 percent; it is most common on the steepest slopes of cleared land. Rough gullied land occurs in small bodies throughout the hilly and steep sections of the county. It comprises a large total acreage.

An important problem on this land type is to check gullying. The erosion on most of these mutilated soils is not stabilized, and the areas should be fenced and planted to fast-growing trees wherever stands can be obtained. Elsewhere mechanical means are necessary.

DEEP SILTY SOILS OF THE UPLANDS

The deep silty soils of the uplands consist of Memphis silt loam, Alford silt loam, and their various phases. They are developed from silt (loess), which at present contains little or no lime. Where the silt deposits are more than 12 feet deep, a calcareous horizon may be present at the lower depths. The Memphis and Alford soils are mapped in two different geographical areas on parent silty materials presumably blown in by winds from different sources. The Memphis soils are in the hilly upland section of the county, which is characterized by great local relief. This area is devoted to general farming on a small scale. The Alford soils occur on the rolling uplands where the slopes are smoother and the relief is gentler than elsewhere. This section is a very productive one devoted to general farming, hog raising, and dairying.

The Memphis and Alford soils resemble each other in color of surface and subsoil. They both lack the tight layer in the subsoil characteristic of the Hosmer and Zanesville soils. The Memphis soils differ slightly from the Alford in being more friable in the subsoil and underlying layers.

The Memphis soils are mapped in the southern part of the county paralleling the Ohio River terraces. They form a narrow band in the east, which widens in the western part of the county. The parent material of this soil appears to be thickest on ridge tops and upper slopes with southern exposures. The steep sloping associated areas of Vanderburgh soils appear to have little loess, probably because of loss through rapid geologic erosion following deposition. The Memphis soils adjoin the Wheeling, Sciotoville, Weinbach, and Ginat soils on the south and the Hosmer, Zanesville, and Vanderburgh soils on the north. They occur on slopes ranging from gently sloping to steep, and are well drained both externally and internally. Various slope and erosion phases are recognized and discussed in this chapter.

The Alford soils are mapped in this county on slopes ranging from level to steep. They are well drained externally and internally and are associated with the Iona, Ayrshire, Ragsdale, and Zipp soils, which occur on the smoother areas or on the flats.

The tree growth on the Alford and Memphis soils is about the same. Originally they were covered with a luxuriant growth of hardwoods. Present stands are principally second-growth red oak, white oak, pin oak, southern red oak, overcup oak, bur oak, shingle oak, black oak, pignut hickory, shellbark hickory, black locust, honeylocust, flowering dogwood, mulberry, white ash, redbud, ironwood, persimmon, tuliptree, sugar maple, black maple, black walnut, linden, American beech, and black tupelo (black gum).

Memphis silt loam.—Memphis silt loam occurs on the ridge tops on slopes ranging from 3 to 6 percent. Runoff is free but not excessive. Internal drainage is good owing to the friable subsoil. It is an important farming soil in the hilly section of the county where general farming is carried on. It appears to be well suited to growing alfalfa although liming is necessary to produce stands.

In wooded areas Memphis silt loam has a thin mat of leafmold, which is underlain to a depth of about one-half inch by dark-gray silt loam. The dark color of this surface soil is due to the presence

of organic matter. This layer in turn is underlain by light grayish-brown silt loam to a depth of 3 to 4 inches. The subsurface soil to a depth ranging from 8 to 10 inches is light grayish-yellow silt loam of very thin platy structure. The upper part of the subsoil to a depth of 12 to 14 inches is brownish-yellow friable heavy silt loam. The lower part of the subsoil to a depth ranging from 28 to 32 inches is yellowish-brown friable silty clay loam, which breaks readily into subangular fragments one-fourth to one-half inch in diameter. The faces of these fragments are coated with light reddish-brown silty clay material, which imparts a distinctly reddish cast to this layer. The subsoil is underlain to depths ranging from 90 to 130 inches by brownish-yellow silt, which may overlie a calcareous layer wherever the silt is deep. Bedrock of gray shale and siltstone or reddish-brown and yellow sandstone underlies the subsoil at a depth ranging from 130 to 190 inches. The reaction is strongly acid to a depth of 10 or 12 feet except where lime has been applied to the surface soil.

The areas included in this type are not seriously eroded. The surface soil losses do not exceed 50 percent, a loss that does not seriously affect the productivity. Practically all of this soil is cleared and cultivated to crops of corn, soybeans, wheat, hay, and vegetables.

Acre yields are as follows: Corn from 20 to 40 bushels, without fertilizer; wheat 10 to 20 bushels; barley 20 to 30 bushels using 70 to 100 pounds of 2–12–6 fertilizer or manure; soybeans 12 to 25 bushels; hay 1 to 2 tons; alfalfa 2 to 4 tons; and potatoes 100 to 150 bushels, when fertilized heavily or manured. Estimated average acre yields under the stated treatment are as follows: Corn 30 bushels, wheat 15 bushels, barley 25 bushels, soybeans 18 bushels, hay 1½ tons, alfalfa 2½ tons, and potatoes 120 bushels. Hay consists chiefly of lespedeza, although timothy and clover, timothy and redtop, and alfalfa are also grown. Many farmers cut soybeans for hay.

The common rotations are corn, wheat, and hay or corn, soybeans, wheat and hay. Wheat is generally fertilized or manured, but fertilizer is seldom used on the other crops. Alfalfa is an exception, because it is necessary to use lime and superphosphate fertilizer to obtain satisfactory stands. The use of lime is not general. The systems of management vary greatly on this soil. Many small farms do not follow any system of rotation. The land is permitted to lie idle in the winter without a cover crop to protect the surface from heavy rains. Higher yields could be obtained under more intensive management, including the use of green manures.

Memphis silt loam, eroded phase.—Memphis silt loam, eroded phase, is similar to the typical soil except that it is more highly eroded. It includes more or less gullied areas that have lost from 50 to 75 percent of the surface soil. The total acreage is small. The same crops are grown and the same management is followed as on the typical soil but the yields obtained are slightly lower, owing to slightly lower productivity caused by more erosion.

Memphis silt loam, level phase.—The level phase of Memphis silt loam occupies slopes ranging from 0 to 3 percent. It is similar to the typical soil, except that it is on nearly level land. Runoff is adequate, and internal drainage is good. Only a few small areas are mapped. Control of erosion is not a serious problem on this soil,

although most of it has lost a small part of the surface soil by erosion. Generally, these losses do not exceed 25 percent, but a few areas are included that have lost as much as 50 percent. Productivity has not been greatly affected by this degree of erosion. The yields and management are about the same as on the typical soil.

Where this soil occurs on flat areas, the subsoil in places is yellow and slightly mottled with gray. Only a few small bodies are included. One such area is mapped near Woodmere where Memphis silt loam joins Sciotoville silt loam.

Memphis silt loam, slope phase.—Memphis silt loam, slope phase, occupies slopes ranging from 6 to 10 percent. Runoff here is slightly more rapid than from Memphis silt loam. The total area of this soil is small. It includes areas that have not lost more than 50 percent of the surface soil by erosion. Many of these areas are in woods or have been recently cleared. The crops grown and management used are the same as for Memphis silt loam, eroded slope phase. The yields given there are slightly lower than on this less eroded soil.

Memphis silt loam, eroded slope phase.—Memphis silt loam, eroded slope phase, occupies slopes ranging from 6 to 10 percent. Rapid runoff has removed from 50 to 75 percent of the surface soil and has cut numerous gullies in cultivated fields. It is the most extensive phase of Memphis silt loam. All of it is cleared and was cultivated at one time. At present much of it is lying idle.

This soil differs from typical Memphis silt loam, in having a shallower surface soil and a slighter depth to bedrock. It is not so productive for the crops of the region as the typical soil. Corn does not do well on the eroded slopes as it tends to fire early in the season. The soil is better suited for close-growing crops and grasses, which help to conserve the surface soil. Corn yields from 10 to 25 bushels an acre; wheat 8 to 16 bushels; soybeans 10 to 20 bushels; hay 1 to 2 tons; and alfalfa 2 to 3 tons. Wheatland is generally fertilized with 70 to 100 pounds of 2–12–6 fertilizer or manure. Corn returns an average yield of about 25 bushels an acre, wheat 12 bushels, soybeans 14 bushels, hay 1½ tons, and alfalfa 2 tons. The same rotations are used as on typical Memphis silt loam.

Soil-conserving crops should be grown on this soil in preference to clean-cultivated crops. Lime, manure, and fertilizer would increase its fertility, give better stands of grasses and legumes, and increase the yields of other crops. Where gullies are not stabilized, they should be sodded or checked by mechanical means.

Memphis silt loam, severely eroded slope phase.—Memphis silt loam, severely eroded slope phase, occurs on slopes ranging from 6 to 10 percent. It has lost from 75 to 100 percent of the surface soil and has numerous gullies. The total area is small. This soil is similar to the eroded slope phase, but it is more severely eroded. It is not suitable for continuous cultivation but is better for permanent pasture or forest. In its present state much of this soil is grown up in briers and weeds. It should be kept in a cover crop in order to protect it against further erosion, and the numerous gullies should be checked by vegetation or by mechanical means. Lespedeza appears to be able to make a growth on these eroded soils.

Memphis silt loam, hill phase.—Memphis silt loam, hill phase, occurs on slopes ranging from 10 to 14 percent. Runoff is rapid, and internal drainage is good. Most of this inextensive soil is in woods and, therefore, is not highly eroded. This soil is not suitable for continuous cultivation, because of its susceptibility to severe sheet and gully erosion if not properly managed.

The surface soil of Memphis silt loam, hill phase, where not eroded is grayish-brown mellow silt loam, 5 or 7 inches thick. The subsoil, which continues to a depth ranging from 18 to 30 inches, is yellowish-brown or brownish-yellow friable silty clay loam. This material breaks readily into subangular fragments one-fourth to one-half inch in diameter. Where the soil is shallow, the lower part of the subsoil is slightly cemented and is reddish brown. Below the subsoil is grayish-yellow gritty hard and cemented silt loam material. Bedrock of shattered platy sandstone or shale lies from 60 to 90 inches below the surface.

Memphis silt loam, eroded hill phase.—Memphis silt loam, eroded hill phase, occurs on slopes ranging from 10 to 14 percent. Runoff from this soil is rapid, resulting in serious sheet erosion if the surface is not protected with a cover crop or forest. It is associated with the typical soil, but occupies the steeper slopes. The loess from which this soil is formed is much shallower on these steep slopes, than on the ridges. It ranges from 36 to 72 inches in depth.

The eroded hill phase of Memphis silt loam includes areas that are slightly gullied and have lost from 50 to 100 percent of the surface soil. Most of this soil is cleared and was cultivated at one time. At present many fields are lying idle. This soil is not suitable for continuous clean cultivation, but it may be used for pasture which involves only occasional cultivation for reseeding. Lespedeza or timothy and redtop will produce on these slopes. Stands of pasture plants, including clover, are better if the land is limed and fertilized. Occasional cultivation may be allowed in order to renew the stands of pasture grasses. Some of the farmers rotate hay with wheat. Yields of wheat are low, ranging from 8 to 14 bushels an acre when the land is fertilized with 70 to 100 pounds of 2-12-6 fertilizer. Hay averages about 1 ton an acre and alfalfa about 1½ tons. Many fruit trees are grown on this soil.

Memphis silt loam, severely eroded hill phase.—Memphis silt loam, severely eroded hill phase, differs from Memphis silt loam, eroded hill phase, only in being more severely eroded and gullied. From 75 to 100 percent of the surface soil has been lost, and practically all fields have some gullies. These gullies are relatively shallow and could be readily stabilized by seeding to a permanent cover. This soil is not often cultivated because of its eroded condition. Permanent pasture or forestry are its best uses.

Memphis silt loam, steep phase.—Memphis silt loam, steep phase, includes areas on slopes ranging from 14 to 35 percent, which have slight or no erosion. Most of this land is too steep for farming and has been left in woods.

The detailed description given for the profile of Memphis silt loam, hill phase, applies to this soil. The depth to bedrock varies

with the position of the soil and the steepness of the slope, being deepest near the top of the slope and shallowest at the base.

Memphis silt loam, eroded steep phase.—Memphis silt loam, eroded steep phase, includes areas on slopes ranging from 14 to 35 percent which are slightly gullied and have lost from 50 to 75 percent of the surface soil. These areas are too steep for cultivation but are better suited for timber. Some of the areas are cleared and lying idle, whereas the rest have a second growth of trees. A large part of this soil occurs in small narrow bodies, associated with the smoother areas of the Memphis soils. The description of the profile of Memphis silt loam, hill phase, is applicable to this soil.

Memphis silt loam, severely eroded steep phase.—The severely eroded steep phase of Memphis silt loam occurs on slopes ranging from 14 to 35 percent. It includes areas that have lost practically all of the surface soil and have numerous gullies in the fields. The total area is small. All of this soil is cleared and was at one time cultivated. Owing to its present condition, most of the areas are grown up in weeds and briers. It is not adapted to continuous cultivation but is better suited for forestry. The description given for the hill phase of Memphis silt loam is applicable to this soil, except for the present state of erosion.

The control of erosion is a problem on this soil. Cleared fields should have a cover crop to check surface washing, and gullies may be stabilized by seeding to a fast-growing legume, such as lespedeza. However, most of this soil should be reforested.

Alford silt loam.—Alford silt loam occurs chiefly in the northwestern part of the county on smoothly rolling upland. It is in a very productive section, one devoted to general farming, hog raising, and dairying. Alford silt loam is well drained both externally and internally, owing to adequate surface runoff and a permeable subsoil. Slopes range from 3 to 6 percent. Practically no uneroded areas of Alford silt loam remain in this county, and the soil has been cleared and cultivated for a long time. The areas included in this type are slightly eroded. The surface soil losses, however, do not exceed 25 percent. A few shallow gullies occur in some fields. Very little Alford silt loam remains because most of it has been moderately eroded and is included on the map with Alford silt loam, eroded phase.

In plowed fields, the 8- or 10-inch surface soil is light grayish-brown silt loam. In wooded areas a layer of leafmold overlies the surface soil and contributes organic matter that darkens it slightly. The upper part of the subsoil to a depth ranging from 14 to 16 inches is light yellowish-brown friable heavy silt loam; whereas the lower part, to a depth ranging from 30 to 36 inches, is bright yellowish-brown friable silty clay loam that crumbles readily into subangular fragments ranging in size from one-fourth to one-half inch. The faces of these fragments are coated with reddish-brown material, which imparts a slight reddish color to the subsoil. The subsoil, in turn, is underlain to a depth ranging from 48 to 60 inches by brownish-yellow silt loam. Below this layer is yellow or light brownish-yellow silt loam or silt that continues to bedrock. On the lower slopes approaching the bases of hills, this layer in many

places is nearly neutral in reaction, but on the ridge tops it is generally acid. Bedrock of sandstone, siltstone, and shale lies from 8 to 12 feet below the surface.

The crop yields, management, and adaptations are discussed under Alford silt loam, eroded phase, which is a more extensive soil.

Alford silt loam, eroded phase.—The eroded phase of Alford silt loam differs from typical Alford silt loam only in the greater amount of surface soil lost by erosion. The slope ranges from 3 to 6 percent. Most of this soil has lost from 25 to 50 percent of the surface and may have from one to three shallow gullies to the acre. Some small areas that have lost from 50 to 75 percent of the surface soil or that are slightly gullied and have lost from 50 to 75 percent of the surface soil are included in this type. These areas would be slightly less productive than those that have more of the surface soil left.

The eroded phase of Alford silt loam resembles the typical soil in all layers except for changes caused by erosion.

All of this soil is cleared and cultivated. Corn, wheat, and hay are the principal crops. Other crops include soybeans, barley, and oats. Hay crops are clover, clover and timothy, or alfalfa. Some lespedeza is grown for hay on areas that have not been limed and that will not grow red clover. The range of yields on an acre for various crops is as follows: Corn 35 to 70 bushels, wheat 15 to 30 bushels, barley 25 to 50 bushels, soybeans 15 to 30 bushels, potatoes 100 to 200 bushels, hay 1 to 2 tons, and alfalfa 3 to 4½ tons. When fertilized, cornland is treated with 50 to 100 pounds of 0–10–10 or 0–12–12 fertilizer and land devoted to wheat or barley with 100 to 125 pounds of 2–12–6 fertilizer. Correspondingly smaller quantities of multiple-strength fertilizer are used whenever they are available. Estimated average acre yields for various crops are as follows: Corn 50 bushels, wheat 22 bushels, barley 35 bushels, soybeans 20 bushels, potatoes 150 bushels, hay 1½ tons, and alfalfa 3 tons. The higher yields reported are obtained in favorable years only under excellent management, which includes liming, fertilizing, use of manure, and turning under of red clover.

The common rotation is a 3-year one, consisting of corn, wheat or barley, and clover. Some farmers use a 4-year rotation of corn, wheat or barley, and hay for 2 years. Much of the red clover is threshed for seed or turned under as a green manure. It likewise furnishes the principal rotation pasture of this area. Practically all of the land in this section is limed. Stands of alfalfa are not difficult to obtain in such fields. Alfalfa is cut for hay or used for hog and cattle pastures. Corn is either fed to hogs or is cut for silage and fed to cattle. Wheat is the principal cash crop. The chief sources of income are from the sale of wheat, hogs, and dairy products.

Checking erosion is a problem on gullied and highly eroded fields. Many of the gullies can be plowed over and planted to thick-growing grasses or legumes. Where the surface is severely eroded, the fertility should be increased and the areas planted chiefly to leguminous cover crops. Liming and incorporating organic matter are valuable aids.

Alford silt loam, level phase.—Alford silt loam, level phase, occurs on slopes of 0 to 3 percent on broad ridge tops associated with

the typical soil. Only a very small area is mapped. It is similar to Alford silt loam in all respects, except that it has a more gentle slope. The yields are likewise similar, although they average slightly higher than on the eroded phase of Alford silt loam. Most of this soil has lost less than 25 percent of the surface soil by erosion, but a few areas are included that have lost from 25 to 50 percent of the surface soil.

The crops grown and systems of management used are the same as for Alford silt loam, eroded phase.

Alford silt loam, eroded slope phase.—Alford silt loam, eroded slope phase, occurs on slopes ranging from 6 to 10 percent associated with areas of the typical soil. Runoff from these slopes is more rapid than on areas of typical Alford silt loam; consequently, this soil is more highly eroded. A few small gullies in most fields, and sheet erosion has nearly everywhere removed from 50 to 75 percent of the surface soil. In mapping, however, a few areas where the loss of surface soil is less than 50 percent are included because of the small total acreage.

The eroded slope phase of Alford silt loam is similar to the typical soil, except that it possesses a thinner surface soil and is shallower over bedrock. Most of it is cleared and produces the same crops as does the typical soil, except that relatively less corn and more small grains and hay are grown. Acre yields of various crops on limed land are as follows: Corn 25 to 45 bushels, where fertilizer is used, wheat 14 to 24 bushels, barley 20 to 40 bushels, soybeans 14 to 25 bushels, hay 1 to 2 tons, and alfalfa 2½ to 3½ tons. The same quantities and types of fertilizers are used on all crops as on Alford silt loam, eroded phase. Average acre yields are estimated as follows: Corn 35 bushels, wheat 18 bushels, barley 30 bushels, soybeans 18 bushels, hay 1.3 tons, and alfalfa 2.7 tons.

Good management is required in farming this soil in order to reduce losses by erosion. Plowing on the contour and use of close-growing crops are necessary. In many fields small gullies have been stabilized by a permanent vegetative cover. The relatively high yields here reported indicate the excellent management of this soil. Lower yields would be obtained if the land was not limed, fertilized, or planted to legumes.

Alford silt loam, severely eroded slope phase.—The severely eroded slope phase of Alford silt loam includes areas that have lost from 75 to 100 percent of the surface soil. In addition, some of the areas have two or three gullies per acre. Most of the gullies are shallow, although a few are deep and embedded in the underlying sandstone, siltstone, and shale.

The soil is similar to the eroded phase of Alford silt loam in that it occupies slopes ranging from 6 to 10 percent, but it is more eroded and consequently shallower to bedrock. It is not suited for continuous cultivation but can be used for permanent pasture. If the gullies were seeded to grass, the resulting sod would reduce loss of surface soil and gullying. Some of the deep gullies may require small check dams in order to stabilize them.

Alford silt loam, severely eroded hill phase.—This soil occurs on slopes ranging from 10 to 14 percent. Runoff is rapid and erosion

is severe if the surface is not protected. Various degrees of erosion exist on areas included in this phase. Most areas are slightly gullied and have lost from 75 to 100 percent of the surface soil, although a few areas that have lost only 50 to 75 percent of the surface soil or that are not gullied are included on the map. Gullies on this soil generally are shallow. Included also are several small areas that have a gradient exceeding 14 percent.

This soil is similar to typical Alford silt loam, except that it has a thinner surface soil and is shallower to bedrock. It is practically all cleared but is not often cultivated. Most of it is in grass and used for pasture. Occasionally the fields are plowed and reseeded in order to renew the stands of grasses. Usually wheat is sown after breaking such a sod. Following wheat, the land goes back to grass. Under such a system of management, losses from erosion can be kept at a minimum.

SOILS DEVELOPED FROM SILTS OF THE LAKE PLAINS

The soils included in this group are derived from deep silts laid down on a broad flat or gently undulating plain that is supposed to represent an ancient lake bed, long since drained by natural means. They occur chiefly in the northwestern part of the county. (See fig. 2.) Originally, only shallow meandering streams flowed sluggishly over this broad lake flat. These natural courses have been straightened and deepened by man in order to allow more rapid removal of the surface waters. Flat Creek is the main stream in the northwestern part of the county. The bodies of alluvial soil are small, having been laid down since the land was cleared.

The soils of this group are all silty in texture—they are chiefly silt loams and, to a less extent, silty clay loams. Under natural conditions drainage was slow to very slow. Two broad subgroups of soils are recognized; (1) Light-colored soils and (2) dark-colored soils. The light-colored slowly drained soils are Iona silt loam, Iona silt loam, eroded gentle-slope phase, Ayrshire silt loam, and Peoga silt loam. The dark-colored very slowly drained soils are Ragsdale silt loam, Zipp silt loam, and Lyles silty clay loam. They occupy depressions that have a high water table. The dark color is due to the presence of organic matter, which has accumulated in these places. At present the dark-colored soils are tile-drained and are among the most productive of the county.

The soils of this group are associated with Alford silt loam, which occurs on more rolling topography at slightly higher elevations. Together with the Alford soils, they comprise one of the most productive sections of the county. A self-sufficing type of general farming is carried on. Hog raising and dairying are the important agricultural enterprises. Practically all of the soils are cleared and cultivated. Most of the corn needed for feed in this section is raised on these relatively level soils, whereas more wheat is raised on the Alford soils. The usual rotations are corn, wheat, and clover or corn, soybeans, wheat, and clover. Some farmers substitute oats or barley for wheat in the rotation. Good management practices, used on practically all farms where these soils occur, consist of tile draining, liming, using fertilizer and manure, rotating crops, growing legumes, and turning under red clover.

Iona silt loam.—Iona silt loam occurs on slopes ranging from 0 to 3 percent and has a small total area. It is associated with the Alford and Ayrshire soils and is intermediate between them in position and natural drainage. Most of the bodies are in the northwestern part of the county, although a few small ones are mapped south of the State highway to Newburgh in the extreme eastern part.

The nearly level surface of this soil has prevented serious erosion. Most of the sodded land has lost less than 25 percent of the surface soil, but, because of their small extent, some areas are included in mapping that have lost as much as 50 percent of the surface soil.

In cultivated fields the 8-inch surface soil of Iona silt loam is yellowish-gray loose or mellow silt loam. It is underlain to a depth of 10 or 12 inches by grayish-yellow fine porous friable silt loam. The upper part of the subsoil, to a depth of 14 or 16 inches, consists of light-yellow or pale-yellow friable heavy silt loam that breaks out into subangular fragments one-fourth to one-half inch in diameter; whereas the material below this, which reaches a depth ranging from 24 to 26 inches, consists of light-yellow or very light brownish-yellow brittle silty clay loam. This material breaks readily into angular and subangular fragments ¾ to 1 inch in diameter. The faces of these fragments are coated with a reddish-brown film, which gives the layer a reticulately mottled appearance and a slight brownish color. Tree and plant roots penetrate the cracks in this layer. Many of the cracks are filled with light-gray silt. The lower part of the subsoil to depths ranging from 32 to 38 inches is light brownish-yellow silty clay loam, which is moderately brittle when dry and slightly plastic when wet. It breaks out into blocky fragments 1 to 3 inches in diameter. As in the layer above, the faces of these fragments are coated with a grayish-brown film. Below this and reaching to a depth of 44 to 50 inches is yellow silt. The material contains some dark-brown and black concretions of manganese or iron oxide and is only slightly acid in reaction. It rests on yellow calcareous silt. The upper layers of this soil are acid in reaction.

All of this soil is cleared and farmed to corn, wheat, barley, hay, and soybeans. Minor crops are potatoes and oats. Hay consists of clover or clover and timothy. Yields and management are about the same as on the Alford soils. Yields of corn usually range from 35 to 70 bushels, wheat 15 to 30 bushels, barley 25 to 50 bushels, soybeans 15 to 30 bushels, potatoes 100 to 150 bushels, hay 1 to 2 tons, and alfalfa 2½ to 4 tons. Cornland usually receives 50 to 100 pounds of 0–10–10 or 0–12–12 fertilizer, and land devoted to wheat or barley 100 to 125 pounds of 2–12–6 fertilizer. Yields of corn average about 50 bushels, wheat 22 bushels, barley 35 bushels, soybeans 20 bushels, potatoes 130 bushels, clover hay 1½ tons, and alfalfa 2.7 tons. Inasmuch as the soil is acid, it is necessary to add lime before stands of alfalfa can be obtained. Clover is likewise benefited by liming.

Iona silt loam, eroded gentle-slope phase.—This phase of Iona silt loam occurs on slopes ranging from 3 to 6 percent and generally shows a slight degree of erosion. Soils showing several degrees of erosion, however, are included in this phase, as only about 100 acres of this soil have been mapped. Losses from erosion in some areas have been less than 25 percent of the surface soil, on others 25 to 50 percent, and on a few small areas from 50 to 75 percent. In addition,

some of these areas have a few small shallow gullies in fields. Surface drainage on this soil is good. This soil resembles the typical soil, except that the surface soil is slightly thinner because of greater losses by erosion. The average productivity has been only slightly reduced below that of the typical soil, as losses from erosion are less than 50 percent of the surface soil throughout 80 percent of the total area.

The management practices are the same as on Iona silt loam.

Ayshire silt loam.—Ayshire silt loam is a moderately slowly drained soil derived from calcareous silts. It occurs on level to undulating land in the northwestern part of the county, closely associated with Ragsdale silt loam and Zipp silt loam. It adjoins the slightly higher lying Iona silt loam.

The surface soil of Ayrshire silt loam is light brownish-gray or gray loose silt loam, 10 or 12 inches deep. The upper subsoil layer to a depth of 18 or 20 inches is gray and yellow mottled silty clay loam that breaks into small subangular fragments one-fourth to one-half inch in size. The faces of these fragments are coated with yellowish-gray colloidal material. The lower subsoil layer, which reaches a depth ranging from 30 to 34 inches, is brownish-yellow compact but friable silty clay loam. This material breaks into blocky fragments ¾ to 1½ inches in size. A thin film of brown colloidal material coats the faces of these fragments and imparts a brownish color to this layer. At a depth ranging from 40 to 48 inches is soft-yellow slightly acid silt loam material containing numerous concretions of iron or manganese the size of a pin head. It is underlain by grayish-yellow calcareous silt.

Most of the Ayrshire silt loam has been limed, and the soil now is only slightly to medium acid in the surface soil and subsoil. Clover can be grown on it without lime, although better stands are produced by liming. This soil is all cleared and cultivated to crops of corn, wheat, barley, soybeans, clover, and some potatoes and is very productive if adequately drained, limed, and fertilized. As it is a colder soil than Alford silt loam or Iona silt loam, crops do not start so early in the spring. Corn usually yields from 35 to 60 bushels an acre, wheat 15 to 28 bushels, barley 25 to 35 bushels, soybeans 15 to 30 bushels, potatoes 100 to 140 bushels, and clover 1¼ to 2 tons. Corn yields, on an average, about 50 bushels an acre, wheat 20 bushels, barley 35 bushels, soybeans 20 bushels, and red clover 1¾ tons. Fertilizer generally is used to grow corn, wheat, barley, and potatoes. Cornland receives from 65 to 125 pounds of 0–12–12 or 0–14–6 fertilizer, and wheatland 100 to 200 pounds of 2–12–6 or 2–16–8 fertilizer. Potatoes are grown only for home use on selected fields, which are heavily manured and fertilized. Alfalfa does not do well on this soil, because it is imperfectly drained. The planting of hybrid corn is increasing, as it can be planted later in wet years and produce as well or better than open-pollinated varieties.

The usual rotation of crops is corn wheat or barley, and clover. Some farmers use a 4-year rotation consisting of corn, soybeans, wheat, and clover. Some of the clover is cut for hay, some is threshed for seed, and much of it is turned under as a green manure. The relatively high yields set forth for this soil would not be obtained without

liming, liberal use of fertilizers and manure, turning under legumes, proper crop rotations, and adequate drainage.

Control of erosion is not a problem, although many areas included on the map with this type have lost some of the surface soil through local washing. The losses in few places exceed 25 percent. Here and there, an area has one to three shallow gullies to the acre.

Peoga silt loam.—Under natural conditions, Peoga silt loam is a slowly drained soil. It occurs chiefly in the northwestern part of the county near Darmstadt around the headwaters of Flat Creek on the old lake plains. It adjoins areas of Johnsburg, Ragsdale, and Ayrshire soils. Most of the land is cleared, drained, and cultivated, although a few areas that remain in woodland are not artificially drained.

In wooded areas Peoga silt loam has a 1-inch surface layer of dark-gray silt loam underlain to a depth of 10 or 12 inches by light-gray loose silt loam. The subsoil, which continues to a depth ranging from 24 to 32 inches, is medium-gray friable compact silt loam or heavy silt loam that is faintly mottled with rust brown. It is underlain to a depth ranging from 42 to 50 inches by light-gray or yellowish-gray compact silty clay loam. Rust-brown stains give a highly mottled appearance to this layer. This material breaks into large clods that can be readily crushed under slight pressure. Below this layer is gray or bluish-gray silty clay loam or silty clay that is highly mottled with rust brown. The reaction of the soil is generally acid in the surface and subsoil. Below this depth the material in places continues to be acid or in other places it becomes sweet. Scattered over the surface are numerous brown iron concretions.

The principal tree growth consists of black oak, pin oak, white oak, post oak, sweetgum, winged elm, American or white elm, redbud, shellbark hickory, persimmon, catalpa, and sassafras.

In order to farm this soil successfully, it is necessary that the land be tile-drained, and most of it is drained in this manner. It is planted to crops of corn, wheat, soybeans, and hay; and, where the land is limed, clover makes a good growth. The usual rotations are corn, wheat, and hay. Timothy and redtop is the main hay crop, although on limed areas clover is grown. Corn yields vary with the season and management practices. In years when the rainfall is moderate and well distributed, corn yields as much as 60 bushels an acre, with the use of 100 to 125 pounds of 0–10–10 or 2–12–6 fertilizer, but the average yield is about 35 bushels. In wet years the yield may fall below 10 bushels. When the seasons are not too wet, wheat yields from 12 to 25 bushels an acre if manure or 100 to 125 pounds of 2–12–6 fertilizer is used. It averages about 18 bushels, but in wet years the yield may be as low as 5 or 10 bushels. Higher yields of corn and wheat than these have been recorded for exceptionally good seasons on land that is well drained and heavily fertilized, but exceptionally high yields are seldom obtained more than twice in a decade. Yields of other crops on drained Peoga silt loam are as follows: Hay 1 to 2 tons an acre, or an average of about 1¼ tons; soybeans 12 to 25 bushels, or an average of about 15 bushels; and potatoes, an average of approximately 100 bushels.

Ragsdale silt loam.—Ragsdale silt loam is the darkest colored soil of the county. It occurs in elongated swales and depressions at the

heads of small streams, north of Armstrong, in the northwestern part of the county. The surrounding soils are Iona, Alford, and Ayrshire. Some of the soil near Flat Creek, adjacent to Gibson County, is mapped on the old lake bed. Ordinarily, one would expect to find the Montgomery soils in this position, but the parent material is too high in silt and too low in clay for the resulting soil to be included with the Montgomery series. A few areas are also mapped in the southeastern part of the county north of the State highway. Ragsdale silt loam is one of the most productive soils of the county when it is adequately drained. In its natural condition, external drainage is slow, because the land is flat and internal drainage is prevented by a higher water table.

Ragsdale silt loam to a depth of 16 to 20 inches is moderately dark-gray finely granular silt loam rich in organic matter. The surface appears to be nearly black when wet. This material grades into mottled gray and yellow friable silty clay loam that breaks into blocky fragments ½ to 1½ inches in diameter. At a depth ranging from 32 to 36 inches it is underlain by a reticulately mottled gray and yellow silt loam. This merges into mottled yellow and brown calcareous silt loam at a depth ranging from 40 to 48 inches. The soil is only slightly acid in the upper layers.

Ragsdale silt loam is well suited to the production of general farm crops but is best suited to corn. Wheat is often winter-killed by freezing and heaving of the soil. This soil is not entirely free from spring overflow in the vicinity of Flat Creek, and occasionally this overflow damages the wheat crop. The major crops grown are corn, soybeans, wheat, and clover. The minor crops include alfalfa, barley, oats, potatoes, and tomatoes. The usual rotations are corn, wheat, and clover, or corn, soybeans, wheat, and clover. Some farmers plant corn 2 years in succession. Cornland is not fertilized, and wheatland is seldom fertilized. When wheatland is fertilized, 100 to 125 pounds of 2–12–6 fertilizer is used.

On tile-drained land the acre yields are about as follows: Corn 40 to 80 bushels, wheat 15 to 30 bushels, soybeans 20 to 35 bushels, potatoes 100 to 150 bushels, clover 1½ to 2½ tons, and alfalfa 2 to 4 tons. Average yields on an acre are about as follows: Corn 50 bushels, wheat 22 bushels, soybeans 25 bushels, potatoes 125 bushels, clover 1¾ tons, and alfalfa 2½ tons. This soil is well suited to tomatoes, but farmers have not obtained consistently good yields. Potatoes are generally grown in small patches for home use.

This soil is probably slightly colder in the spring than the surrounding soils of the uplands. Owing to wetter conditions, it cannot be worked so early as soils with good runoff. Drainage no longer is a problem, because most of the soil is tile-drained.

Zipp silt loam.—Zipp silt loam is a poorly drained soil associated with Ragsdale silt loam and Ayrshire silt loam in the northwestern part of the county. In surface color, it is intermediate between Ragsdale, which is dark gray, and Peoga silt loam, which is light gray. Zipp silt loam occurs on the lake-plain flats in very shallow depressions, which did not accumulate as much organic matter as the deeper depressions characteristic of Ragsdale silt loam. Zipp silt loam is generally slightly more acid and is underlain by heavier

soil material than Ragsdale silt loam. It is poorly drained and requires tiling for successful farming.

The 8-inch surface soil is medium-gray or light brownish-gray loose silt loam. It is underlain to a depth ranging from 12 to 15 inches by medium-gray friable silt loam highly mottled with rust brown. This layer, in turn, is underlain to a depth ranging from 20 to 24 inches by medium-gray friable heavy silt loam that is faintly mottled with rust brown. It breaks into small angular fragments one-fourth to one-half inch in diameter. Below this layer and reaching to a depth of about 36 inches is gray to medium-gray slightly plastic silty clay loam that breaks into angular fragments 1 to 2 inches in diameter. Throughout this layer are numerous rootlet channels that are stained rust brown. This material gives way at a depth of about 48 inches to gray intermingled with yellow slightly plastic silty clay loam containing numerous iron stains and concretions. This rests on grayish-yellow slightly plastic silty clay loam mottled with gray and stained rust brown. The reaction is slightly acid to a depth of about 24 inches, below which it is neutral.

Most of this soil is cleared and cultivated. It has the same crop adaptations, limitations, and management as Ragsdale silt loam, with which it is farmed. The yields are slightly lower on this soil, owing probably to its lower organic-matter content and more acid reaction. It responds very well to management, including tile drainage, use of manure or fertilizers, and turning under green manures. Although the soil is slight to medium acid, clover will grow on it without lime. The same rotations of corn, wheat, and clover or corn, soybeans wheat, and clover are used as on Ragsdale silt loam. Likewise the same quantities and types of fertilizers are applied for the various crops. Range of acre yields on the drained soil are as follows: Corn 35 to 70 bushels, wheat 15 to 25 bushels, soybeans 15 to 30 bushels, potatoes 100 to 125 bushels, clover 1 to 2 tons, and alfalfa 2 to 3 tons. Estimated average acre yields are as follows: Corn 50 bushels, wheat 20 bushels, soybeans 20 bushels, potatoes 110 bushels, clover 1½ tons, and alfalfa 2.2 tons. This soil is not well adapted to alfalfa because of a relatively high water table. Tomatoes are not grown for commercial purposes.

Lyles silty clay loam.—Lyles silty clay loam occupies the part of an old lake bed that is now subject to flooding, principally along Flat Creek and its tributary, Pond Flat Ditch. Other small areas are mapped northwest of Darmstadt, northwest of the Evansville airport, and along Licking Creek. It is associated with Peoga, Keyesport, Algiers, and Inglefield soils. In the vicinity of Armstrong this soil is referred to as "gumbo."

This soil to a depth of 12 or 14 inches is dark brownish-gray or bluish-gray silty clay loam. It is underlain to a depth ranging from 24 to 30 inches by heavy compact silty clay loam of the same color but mottled with rust brown. It breaks into coarse blocky fragments, 2 to 4 inches in diameter. This layer, in turn, is underlain by medium-gray or bluish-gray silty clay or silty clay loam that is strongly mottled with rust brown. This soil generally is acid to a depth ranging from 12 to 24 inches and neutral below this depth. In a few places, however, it is neutral to the surface. A few small areas included in this type have a silt loam surface soil.

Lyles silty clay loam covers a small total area. About 50 percent of it is in woodland. The tree growth consists of American elm (white elm), beech, sweetgum, pin oak, silver maple, shellbark hickory, bur oak, red oak, sassafras, mulberry, white ash, sycamore, redbud, hackberry, cottonwood, and boxelder. A small area along Licking Creek is in pasture, and the rest is in cultivation. Cultivated areas are tile-drained. The principal crops grown are corn, wheat, hay, and soybeans. Corn occupies the largest proportion of this soil. The yields obtained vary with the seasons. In wet seasons, corn may yield as little as 20 bushels an acre and wheat may be ruined. In a normal year, corn yields from 30 to 45 bushels an acre, wheat 10 to 20 bushels, soybeans 12 to 25 bushels, and hay 1 to 2 tons. Estimated average acre yields are as follows: Corn 30 bushels, wheat 12 bushels, soybeans 20 bushels, and hay 1½ tons. Wheat usually is fertilized or manured.

SOILS DEVELOPED FROM SLACK-WATER CLAYS

The soils developed from slack-water clays are derived from heavy calcareous clay materials that were laid down as terrace deposits in an old glacial lake known to geologists as Lake Pigeon. The area is now drained by Pigeon Creek, which flows into the Ohio River at Evansville. In addition, in the southwestern part of the county remnants of the old backwater terraces extend north from the Ohio River terraces along narrow bottoms that reach far back into the hills. The area formerly known as Lake Pigeon has an undulating surface with the light-colored soils on the slight rises and the dark-colored soils in the flat depressions. The light-colored soil is McGary silt loam and the dark-colored soils are Montgomery and Zipp silty clay loams. These are naturally poorly drained. Along the slopes of natural drainageways, particularly along Pigeon Creek, the soil is Markland silt loam. Markland silt loam occurs over a wide range of slopes that in cleared areas have eroded to various degrees. The slope and eroded phases of Markland silt loam are described in this section. The Markland soils occur in narrow strips only on the breaks of streams. Because of their position and also their small total acreage, they are not so suitable for farming as the McGary, Montgomery, and Zipp soils.

The area north of Pigeon Creek is a dairy section. Here, the Montgomery, Zipp, and McGary soils produce the grain and hay necessary to support dairying. On the same soils, south of Pigeon Creek, a cash-grain farming is carried on, and corn, wheat, and soybeans are sold as cash crops. When adequately drained, Montgomery and Zipp silty clay loams are among the most productive soils of the area. They are well adapted to the production of general farm crops, but especially to corn. These soils will grow clover without lime as they are only slightly acid. McGary silt loam is especially adapted for wheat.

Markland silt loam, eroded phase.—Markland silt loam, eroded phase, is mapped along Pigeon Creek and in the southwestern part of the county on slopes ranging from 3 to 6 percent, which allow free runoff. It occurs in small bodies and has a small total acreage. Most of it is cleared and eroded, and there remains practically no uneroded

typical soil such as occurs outside the county. Losses of surface soil range from 25 to 75 percent, but in most of the areas they range from 25 to 50 percent. Areas having a few gullies are included where the losses of surface soil do not exceed the above-stated limits.

The surface soil of Markland silt loam, eroded phase, is grayish-brown silt loam 6 or 8 inches deep. The subsoil to a depth ranging from 16 to 24 inches is yellowish-brown silty clay loam that breaks into subangular fragments one-fourth to one-half inch in diameter. These fragments are fairly resistant to crushing. This material is underlain by an 8- to 10-inch layer of dull-brown or slightly grayish-brown tough silty clay loam or silty clay. This layer breaks into angular fragments ranging from 1 to 2 inches in size. It rests at a depth ranging from 24 to 40 inches on dull brownish-yellow or grayish-brown calcareous silty clay loam or silty clay material. In places there are interbedded strata of calcareous silt loam. The soil is acid in the surface soil and subsoil. Internal drainage is slightly impeded by the heavy subsoil.

Markland silt loam, eroded phase, is used for general farm crops, such as corn, wheat, clover, soybeans, and alfalfa. The usual rotation is corn, wheat, and clover; or corn, soybeans, wheat, and clover. Yields of corn range from 25 to 50 bushels an acre, wheat 12 to 25 bushels, soybeans 12 to 25 bushels, clover 1 to 2 tons, and alfalfa 2 to 4 tons. Wheatland is usually fertilized with 100 to 125 pounds of a 2–12–6 fertilizer. Estimated average acre yields are as follows: Corn 30 bushels, wheat 16 bushels, soybeans 17 bushels, clover 1½ tons, and alfalfa 2¾ tons. Lime must be used in order to grow alfalfa.

Markland silt loam, severely eroded phase.—This soil resembles the eroded phase of Markland silt loam, but it is more eroded. Most of the areas have lost all the surface soil, and some have even lost the upper part of the subsoil. The phase includes areas that contain deep gullies and that have lost from 50 to 75 percent of the surface soil. The total area of this soil is small, and it is not suited to continuous cultivation, owing to the diminution of productivity by erosion. Such areas should be planted to grasses or legumes and kept under vegetative cover most of the time.

Markland silt loam, slope phase.—Markland silt loam, slope phase, occurs on slopes ranging from 6 to 10 percent. The surface soil to a depth of 6 or 8 inches is grayish-brown silt loam. The subsoil to a depth ranging from 16 to 24 inches is of yellowish-brown silty clay loam or silty clay that breaks into tough subangular or angular fragments one-fourth to one-half inch in diameter. The parent material is dull-brown tough calcareous laminated silty clay.

Markland silt loam, slope phase, is practically all covered by woods of various deciduous species and when cleared should be used only for close-growing crops. Areas that have been cleared have been eroded and are separated as an eroded slope phase and a severely eroded slope phase.

Markland silt loam, eroded slope phase.—This soil occupies slopes ranging from 6 to 10 percent associated with areas of the typical soil. Runoff from these slopes is fairly rapid and has resulted in the removal of much of the surface soil. Most of the soil has lost from 50 to 75 percent of the surface soil, although a few areas included

have smaller losses. Wooded areas have lost little or no surface soil by erosion. Practically all of this soil is cleared and cultivated. The total acreage is small. The same crops are grown as on Markland silt loam, eroded phase, although the yields are lower, owing to the lower fertility and moisture content. This soil is well adapted to either clover or alfalfa hay. Average acre yields are estimated to be as follows: Corn 25 bushels, wheat 12 bushels, soybeans 14 bushels, clover 1½ tons, and alfalfa 2½ tons.

This soil should be planted to close-growing crops most of the time. If planted to clean-cultivated crops, it should be plowed on the contour in order to reduce the rate of soil loss.

Markland silt loam, severely eroded slope phase.—The severely eroded slope phase of Markland silt loam occurs on slopes ranging from 6 to 10 percent. It consists of areas of Markland silt loam that are gullied and that have lost most or all of the surface soil. In places the upper part of the subsoil has been removed by erosion. Only a small total area of this soil is mapped—most of it along the breaks of Pigeon Creek. All of this land is cleared, but, in its present condition, it is unsuited for crops and should be used for permanent pasture or forestry.

Markland silt loam, eroded steep phase.—The eroded steep phase of Markland silt loam occurs on slopes ranging from 10 to 14 percent. Rapid runoff has induced severe sheet erosion where the soil is not protected. The areas included in this soil have lost from 50 to 75 percent of the surface, and some contain a few short gullies. The total acreage is small. This soil is not suited for continuous cultivation but is better used for permanent pasture.

Markland silt loam, severely eroded steep phase.—Markland silt loam, severely eroded steep phase, is the most extensive of the various phases of Markland silt loam. It occurs on slopes ranging from 10 to 25 percent. Most of it is mapped along the steep banks of Pigeon Creek, although narrow strips occur in the southwestern part of the county at the base of Memphis or Vanderburgh soils. All of the land has been cleared at one time, but some areas are now reverting to woods. Severe erosion has removed most of the surface soil and, in places, a part of the subsoil. Gullies occur in most fields, although these are not very deep. In a few small areas, the soil is practically destroyed.

This soil differs from the steep phase of Markland silt loam in having little or no surface soil left and in being shallower to the calcareous parent material. Many of the exposed slopes are strewn with nodules and concretions of lime. In its present condition this soil is not suited to farming. Forestry is its best use.

McGary silt loam.—McGary silt loam is the light-colored soil associate of the dark-colored Montgomery and Zipp silty clay loams. It occurs as irregular flats and low hummocks surrounded by large areas of Montgomery or Zipp soils. McGary silt loam is most extensive in the vicinity of Pigeon Creek, although some areas occur in the southwestern part of the county. Runoff is slow, owing to the relatively flat surface. Internal drainage is likewise slow, as the tough plastic subsoil hinders the downward percolation of water.

Most of this soil is cleared, although a few areas are still in woods.

These areas are not artificially drained. The present tree growth includes post oak, black oak, pin oak, shellbark hickory, persimmon, sweetgum, American elm, winged elm, redbud, and sassafras.

In wooded areas beneath a thin layer of leafmold there is a gray silt loam 2 or 3 inches thick having a soft very thin platy structure. It is underlain to a depth of 8 or 9 inches by light-gray and yellow mottled silt loam that breaks into angular and subangular fragments one-sixteenth to one-fourth inch in diameter. In plowed fields these two layers are thoroughly mixed so that the rust-brown mottlings disappear, and the material appears a uniform light gray. It is underlain by gray and yellow mottled silty clay loam 3 or 4 inches thick that breaks out into subangular fragments one-half to three-fourths inch in diameter. Below this layer to a depth of 18 or 20 inches is mottled gray and yellow tough silty clay loam or silty clay. This material is plastic when wet and breaks into coarse blocky fragments about 2 inches in diameter. The soil to this depth is strongly acid. The lower part of the subsoil is olive or olive-brown tough waxy silty clay that is only slightly acid in reaction and becomes sweeter with depth. It is underlain, at a depth ranging from 36 to 54 inches, by gray and olive-brown calcareous silty clay parent material.

A few areas that are not so well drained as the typical soil are included with McGary silt loam. These have a slightly grayer surface soil and a gray and yellow subsoil that is mottled to greater depths. For the most part, McGary silt loam is essentially uneroded, although a few slightly eroded areas are included.

Owing to the predominance of post oak growing on McGary silt loam, it is locally termed post oak land, which carries with it a connotation of an infertile soil. It is true that this soil needs fertilizer and lime, as well as artificial drainage, but it is very responsive to such good management and produces good yields of all the general farm crops. It is best suited to wheat and grasses. Small bodies of McGary silt loam are farmed in conjunction with large areas of Montgomery and Zipp soils. The principal crops are corn, wheat, clover, and soybeans. Other crops grown to a smaller extent include barley, oats, and tomatoes. The usual rotations are corn, wheat, and clover or corn, soybeans, wheat, and clover. On well-drained areas corn yields from 25 to 45 bushels, wheat 15 to 30 bushels, barley 35 to 50 bushels, oats 30 to 50 bushels, soybeans 10 to 25 bushels, clover 1¼ to 2 tons, and tomatoes 5 to 12 tons. Wheat or barley usually is the only crop in the rotation for which applications of fertilizer—commonly 100 to 150 pounds of 2–12–6—are made. Land devoted to tomatoes receives about 300 pounds of a 0–20–20 fertilizer. Yields of tomatoes are not dependable, and this crop does better on the dark-colored soils than on McGary silt loam. Higher yields of corn can be expected with the use of fertilizer. Estimated average acre yields are as follows: Corn 30 bushels, wheat 18 bushels, barley 35 bushels, soybeans 18 bushels, and clover 1½ tons.

Montgomery silty clay loam.—Montgomery silty clay loam is the dark-colored soil associated with Zipp silty clay loam and McGary silt loam. It occurs in depressions or basinlike areas, and, under natural conditions, has a high water table. It is an extensive soil in the southeastern part of the county in the vicinity of Pigeon Creek,

although a few small bodies are mapped in the northwestern part. High contents of organic matter, available plant nutrients, and moisture make it one of the best soils in the county for corn.

The surface soil of Montgomery silty clay loam to a depth of 12 or 14 inches is moderately dark-gray or dark brownish-gray silty clay loam. It is underlain to a depth ranging from 18 to 22 inches by light-gray and yellow mottled or olive-gray silty clay loam that has a blocky structure and is slightly plastic when wet. Below this depth is yellowish-gray stiff silty clay loam or silty clay mottled with rust brown. The soil is usually slightly acid or neutral in reaction. At a depth of 54 inches or more the material is calcareous in places.

Included with Montgomery silty clay loam are a few small areas having a silty clay surface soil and clay subsoil. Montgomery silty clay loam must be plowed when it is not wet; otherwise hard unbreakable clods will form, making it difficult to prepare a good seedbed.

Practically all of this soil is cleared, cultivated, and drained. When adequately drained, it produces good yields of all the crops grown in the county. Montgomery silty clay loam occurs in the dairying and cash-grain farming sections. In the dairying section it is farmed to corn, soybeans, wheat, and clover. In the cash-grain section hay is less important although clover is grown in the rotation of corn, wheat, and clover or corn, soybeans, wheat, and clover. Soybeans are frequently plowed under in order to improve the structure of the soil and increase the organic-matter content. The soybeans have been plowed under principally by those farmers who received benefit payments from the Federal agricultural farm program. Other less important crops grown include tomatoes, alfalfa, barley, oats, and potatoes.

Corn yields from 40 to 70 bushels an acre, wheat 15 to 30 bushels, barley 30 to 45 bushels, soybeans 20 to 30 bushels, clover 1¼ to 2¼ tons, alfalfa 2½ to 3½ tons, tomatoes 5 to 15 tons, and potatoes 100 to 250 bushels. Corn returns an average yield of approximately 50 bushels an acre, wheat 19 bushels, barley 30 bushels, soybeans 24 bushels, clover 1½ tons, and alfalfa 2½ tons. When wheat and barley are grown, the land is commonly fertilized with 100 pounds of 2–12–6 fertilizer. Some farmers do not use fertilizer but use manure if it is available. Tomatoes and potatoes are heavily fertilized and manured. Potatoes are grown only for home consumption.

Zipp silty clay loam.—Zipp silty clay loam is associated with Montgomery silty clay loam and McGary silt loam, generally between the two soils, but also on large flats. It is very similar to Montgomery silty clay loam, but slightly less dark in the surface soil and generally slightly more acid. It is formed in shallower depressions than is Montgomery silty clay loam. Under these conditions slightly less organic matter has accumulated resulting in a lighter colored surface soil, compared with those features of the Montgomery soil.

The surface soil is brownish-gray silty clay loam 8 or 10 inches deep. It is underlain to a depth ranging from 18 to 22 inches by gray and rust-brown mottled tough silty clay loam or silty clay that has a blocky structure and is plastic when wet. Below this layer is a rust-brown and gray mottled tough silty clay or clay. The surface soil is generally medium to slightly acid, and the subsoil is nearly neutral. Lime occurs at a depth ranging from 54 to 60 inches. In

many places the water table stands less than 4 feet below the surface.

All of this land is cleared and drained. The soil is used for the same crops and is farmed under the same management as Montgomery silty clay loam. Yields are about the same as on that soil or slightly less, where the soils are equally well drained, although average yields of wheat may be slightly lower, owing to greater danger of winter-killing resulting from poor subdrainage. Alfalfa likewise would not do so well under these conditions as on the Montgomery soil.

SOILS OF THE OHIO RIVER TERRACES

Soils of the Ohio River terraces have developed from old alluvial sands, silts, and clays, but principally silts. These soils occur in the southern part of the county on terrace or benchlands adjoining the Ohio River flood plain. The land area is dominantly level but has been intrenched by small streams or sloughs. On the breaks of these sloughs the surface ranges from gently sloping to steep. The Wheeling soils are mapped principally in these positions. In the southernmost part of this area the topography is dunelike, comprising long narrow ridges of sandy soils of the Wheeling series. On the basis of natural drainage, the three major groups of soils recognized are well drained, imperfectly drained, and slowly drained. The first subgroup includes the Wheeling and Woodmere soils, the second includes the Sciotoville and Rahm soils, and the third includes the Weinbach and Ginat soils. The slowly drained soils are intermittently wet and dry, rather than continuously wet. With the exception of the Woodmere and Rahm soils, the soils of this group are strongly acid in the surface layers. The Wheeling series consists of three types and numerous slope and eroded phases. It is characterized by a grayish-brown surface soil and brownish-yellow or bright yellowish-brown friable subsoil. The Woodmere soils have brownish-gray surface soils and brownish-yellow subsoils, which are faintly mottled with gray in places. The Sciotoville and Rahm soils have brownish-gray surface soils and pale-yellow subsoils. Generally the subsoils of Rahm soils are mottled with gray. The Weinbach and Ginat soils have light-gray or brownish-gray surface soils and gray subsoils, which are underlain by a claypan that hinders the downward movement of water. The Ginat soil is more slowly drained than the Weinbach and generally occurs in shallow depressions, whereas the Weinbach occurs on flats.

The soils of this group are practically all cleared except on the steepest slopes and in the poorly drained areas. Many areas of the soils on flats are tile-drained. These soils are in the cash-grain farming section. The cash crops are corn, wheat, and soybeans. Other crops include barley, lespedeza, and alfalfa. Alfalfa can be grown on the Rahm and Woodmere soils without liming, but lime must be supplied to the other soils of this group. The average productivity of the soils of this group compares favorably with the average for the county. Much better yields could be obtained, if the soils were more generally limed and more heavily fertilized and if legumes were turned under more frequently.

Wheeling silt loam.—Wheeling silt loam occurs on the Ohio River terraces on slopes that do not exceed 3 percent. Runoff from this

soil is adequate and internal drainage is good. Only a very small area is mapped. Wheeling silt loam is associated with the imperfectly drained Sciotoville silt loam. About one-third of the Wheeling silt loam has lost some of the surface soil by erosion, but the losses have not been sufficient to reduce the productivity.

The 8- to 10-inch surface soil is grayish-brown silt loam. It is underlain by a 3- or 4-inch layer of light brownish-yellow heavy silt loam that is slightly compact. The upper part of the subsoil, which reaches a depth of about 28 inches, is yellowish-brown friable silty clay loam. This material breaks into subangular fragments one-half to three-fourths inch in diameter. The lower part of the subsoil, which reaches a depth ranging from 40 to 48 inches, is brownish-yellow silty clay loam, slightly streaked with gray silt. This material breaks into coarse blocky fragments. It is underlain by yellowish-brown silt loam material, which becomes lighter in texture with increasing depth. At a depth ranging from 70 to 90 inches the soil rests on stratified sands. Small flakes of mica are conspicuous in the lower part of the soil. The reaction is acid throughout.

All the land is cleared and devoted to crops of corn, wheat, soybeans, hay, and alfalfa. Hay is principally lespedeza, although some red clover or timothy and red clover is grown on areas that are limed. Most of the lespedeza is threshed for seed, although some is fed to dairy cows. The usual rotations are corn, soybeans, wheat, and hay; or corn, wheat, and soybeans. Corn yields from 25 to 45 bushels an acre, wheat 12 to 25 bushels, soybeans 15 to 25 bushels, hay 1 to 2 tons, and alfalfa 2 to 3 tons. These crops return average acre yields of about 35 bushels, 16 bushels, 18 bushels, 1½ tons, and 2 tons, respectively. Wheatland usually is fertilized with 100 to 125 pounds of 2–12–6 fertilizer.

Lime is not generally used on this soil except for alfalfa fields. It is necessary to use lime for the successful growth of red clover. As a rule, fertilizers are used only for wheat, although the other crops would benefit from the use of fertilizer. Green manuring is not a common practice.

Wheeling silt loam, eroded gentle-slope phase.—The eroded gentle-slope phase of Wheeling silt loam occurs on slopes ranging from 3 to 6 percent associated with the typical soil. Runoff from these slopes is free, and most of this soil has lost some of the surface by erosion. The losses generally do not exceed 50 percent. Some slightly gullied areas are included with this phase. The soil is similar to typical Wheeling silt loam except that it is slightly more eroded and sloping. The crops grown on and the management of this soil are about the same as for Wheeling silt loam, but yields are somewhat less.

Wheeling silt loam, eroded slope phase.—Wheeling silt loam, eroded slope phase, occurs in small bodies on slopes ranging from 6 to 10 percent and is associated with the typical soil. Runoff is fairly rapid, and the surface soil is lost rapidly wherever it is not adequately protected by a vegetative cover. The losses of surface soil did not exceed 75 percent at the time the map was made. A few included areas are slightly gullied. The total area of this soil is small.

Most of this soil is farmed in conjunction with the typical soil, although it is not so well suited to corn because corn tends to fire early in the season. The treatment and management practices are about the same as on typical Wheeling silt loam. The yields are slightly lower, owing to lower fertility and lower moisture content, compared with those features of the typical soil. Estimated average acre yields are as follows: Corn 25 bushels, wheat 12 bushels, soybeans 14 bushels, hay 1¼ tons, and alfalfa 1¾ tons.

In farming this soil, it is necessary to plow on the contour. Strip cropping is probably not practical as the individual areas are small.

Wheeling silt loam, severely eroded slope phase.—This soil differs from the eroded slope phase of Wheeling silt loam in that sheet and gully erosion have removed most or all of the surface soil. It occurs in small bodies on slopes ranging from 6 to 10 percent. In its present condition, it is not suitable for continuous cultivation but is better used for permanent pasture. Lespedeza grows readily on such areas.

Wheeling silt loam, eroded steep phase.—This soil occupies slopes ranging from 10 to 14 percent. It occurs in narrow bodies along stream banks, principally those of Pigeon Creek. Runoff from these slopes is rapid and results in the removal of the surface soil where it is not adequately protected. Losses of surface soil did not exceed 75 percent when the map was made, and a few of the areas were slightly gullied. This soil is similar to typical Wheeling silt loam, except that it is not so deep to the sandy substratum. Both surface soil and subsoil are thinner than the corresponding layers of the normal soil.

Some of this soil is cleared and cultivated in patches, but most of it is in second-growth trees. Except in the steepest areas it is suitable for permanent pasture.

Wheeling silt loam, severely eroded steep phase.—This soil occurs on slopes ranging from 10 to 14 percent. Only 25 acres occur on slopes steeper than 14 percent. All areas have shallow gullies and have lost over 75 percent of the surface soil. Most of the areas are now lying idle. This soil is not suited for continuous cultivation and should be protected with a vegetative cover, preferably trees. The total area is small.

Wheeling loam.—Wheeling loam occurs on slopes ranging up to 3 percent in the southeastern and southwestern parts of the county, associated with Wheeling silt loam and Wheeling fine sandy loam. In the southeastern part of the county it adjoins Memphis silt loam and resembles it in color of surface soil and subsoil. Both surface and internal drainage are good. Wheeling loam has a slightly browner surface soil and more reddish subsoil than has Wheeling silt loam. Good internal drainage is due to the relatively shallow depth to the sandy substratum. Sheet erosion has affected some areas slightly but not sufficiently to impair the productivity.

The surface soil of Wheeling loam to a depth of 8 or 10 inches is a very light-brown mellow loam having a slightly grayish shade. The texture of the surface soil is variable. In places it is more nearly a very fine sandy loam and elsewhere a light silt loam. The subsurface layer, which is 5 or 6 inches thick, consists of light brownish-yellow friable heavy loam or heavy silt loam. The subsoil to a depth ranging

from 27 to 30 inches is yellowish-brown friable clay loam or fine sandy clay loam that breaks readily into subangular fragments one-fourth to one-half inch in diameter. The faces of these fragments are coated with a film of light reddish-brown colloidal material that imparts a distinctly reddish cast to the subsoil. This reddish cast is more pronounced when the soil is wet. The subsoil is underlain by a brown or reddish-brown compact and friable fine sandy loam that passes into yellow loose loamy fine sand or fine sand at a depth ranging from 40 to 60 inches. The soil is acid throughout. In a few places a 2- to 6-inch calcareous sandy layer was observed in the substratum approximately 5 feet below the surface.

This soil is all cleared and cultivated. Many of the areas are included in the urban section of the county where it is used for home sites and small garden plots. No definite system of management prevails in such areas, but in the larger areas it is farmed and treated the same as Wheeling silt loam. The friable subsoil is well suited to the growth of alfalfa roots, but lime must be added before stands can be obtained. The yields of corn and wheat are probably slightly lower than on Wheeling silt loam, owing to the more droughty condition of this soil caused by the relatively shallow depth to the sandy substratum. More clover appears to be grown on this soil than on the silt loam. Such areas are limed. Estimated average acre yields are as follows: Corn 30 bushels, wheat 12 bushels, soybeans 18 bushels, clover 1½ tons, and alfalfa 2 tons. Some of the clover is threshed for seed. Wheatland is usually fertilized with 100 pounds of 2–12–6 fertilizer to the acre.

Wheeling loam, eroded gentle-slope phase.—This soil occupies slopes ranging from 3 to 6 percent associated with Wheeling loam. Runoff from this soil is slightly more rapid than from the smoother areas of Wheeling loam; consequently, more of the surface soil has been washed away. The losses in most places do not exceed 50 percent but in a few small areas losses of surface soil range from 50 to 75 percent. The total area is small. Yields are slightly lower than on Wheeling loam under the same management.

Wheeling fine sandy loam.—Most of Wheeling fine sandy loam is in the southeastern part of the county near the Angel Mounds, but a few small areas are in the southwestern part of the county along Duesner Road. Wheeling fine sandy loam occurs on level ridge tops surrounded by various slope phases. These ridges present a dunelike topography. The small total area of this soil has been cleared.

Wheeling fine sandy loam resembles Wheeling loam but is more sandy in the surface soil and is slightly redder in the subsoil. Internal drainage is more rapid than in that soil owing to the lighter textured subsoil and the sandy substratum.

In cultivated fields the 8- or 10-inch surface soil of Wheeling fine sandy loam is light-brown mellow fine sandy loam. The upper subsoil layer, which reaches a depth of 20 to 24 inches, is reddish-brown fine sandy clay loam and sandy loam. This material breaks readily into subangular fragments one-fourth to one-half inch in diameter. The lower subsoil layer, which reaches a depth ranging from 28 to 32 inches, is yellowish-brown slightly compact friable fine sandy loam. It is underlain by brownish-yellow loose loamy fine sand that merges into a yellow or grayish-yellow loose loamy fine sand from 40 to 60

inches below the surface. Below this layer is grayish-yellow calcareous loamy fine sand. The soil is medium to slightly acid throughout. It is naturally adapted to clover and alfalfa although these crops are not grown extensively. Melons would do well, but raising them is not profitable because this soil is in small isolated bodies. Corn, wheat, and hay are raised to some extent. Most of the hay consists of lespedeza, and the rest consists of timothy and clover. Corn and wheat yields under similar treatment would be slightly lower than on Wheeling loam or Wheeling silt loam, because this soil is more droughty.

Wheeling fine sandy loam, eroded gentle-slope phase.—This soil is associated with Wheeling fine sandy loam, but occurs on slopes ranging from 3 to 6 percent. Runoff is more rapid from this soil than from typical Wheeling fine sandy loam and has resulted in the removal of much of the loose surface soil. Losses of surface soil range from 25 to 75 percent. Only a small total area is mapped, half of which is in the urban district. This soil is not important agriculturally. It is used principally for home gardens and for hay. Some corn and wheat are grown on the more level areas.

Wheeling fine sandy loam, eroded slope phase.—This soil occurs on the steeper slopes of dunelike ridges of Wheeling fine sandy loam. The gradient ranges from 6 to 10 percent, but a few included areas are mapped on slopes ranging from 10 to 14 percent. Eighty percent of this soil has lost from 50 to 75 percent of the surface soil, and the rest has lost less than 50 percent. In addition some of the areas are slightly gullied. Only a very small total area is mapped. All the land is cleared, and most of it is used for growing lespedeza hay.

Woodmere silty clay loam.—Woodmere silty clay loam occurs in the southeastern and southwestern parts of the county on low terraces adjacent to the Ohio River flood plain. It is intermediate in elevation and position between the alluvial soils of the Ohio River and the higher terraces, which give rise to the Wheeling, Sciotoville, Weinbach, and Ginat soils. It is subject to occasional inundation by extremely high waters of the Ohio River. Floods, especially in the spring of 1913 and 1937, left thick sediments of sweet alluvium over old acid soils resembling Wheeling and Sciotoville silt loams. This rejuvenated old soil belongs to a new series known as Woodmere. Woodmere silty clay loam is fairly well drained both externally and internally. It occurs on slopes ranging from 0 to 3 percent.

The 6- to 12-inch surface soil is dull-brown silty clay loam that is neutral in reaction. It is underlain, to a depth ranging from 16 to 24 inches, by pale-brown friable silty clay loam. In places, this material is slightly mottled with gray at the lower depths, and its reaction is neutral. The upper part of the subsoil, which reaches a depth ranging from 24 to 28 inches, is yellowish-brown compact silty clay loam. It has a slight reddish cast and is slightly acid in reaction. The lower part of the subsoil, which reaches a depth ranging from 36 to 42 inches, is brownish-yellow heavy silty clay loam. This material is faintly streaked with gray and is very strongly acid in reaction. It breaks into subangular fragments one-half to three-fourths inch in diameter. It is underlain to a depth ranging from 48 to 60 inches by light brownish-yellow strongly acid compact light silty clay loam or

loam mottled with gray. Strongly acid sandy material occurs below this and extends to a depth of 8 or 10 feet. Mica flakes are present in all layers. Where this soil borders or is close to the Ohio River it is neutral in all layers. One such area is north of Cypress.

Practically all of this land is cleared and cultivated. In most places it is farmed in conjunction with the Ohio River bottoms and is used chiefly for growing corn and soybeans. It is part of the cash-grain farming section. Only a small quantity of hay is produced because there is no profitable market, and the number of livestock kept on farms is small. This soil is naturally suited to alfalfa, because the reaction is neutral in the upper layers and no lime need be added. The usual rotations are corn, soybeans, and wheat; or corn and soybeans. Fertilizer is seldom used. Much of the corn grown is of hybrid varieties, which give better yields and can be sown later than open-pollinated varieties. Corn yields from 25 to 60 bushels an acre, although yields of as much as 70 bushels of hybrid corn have been reported in favorable seasons. The average yield of open-pollinated corn is approximately 35 bushels an acre, and for the adapted varieties of hybrid it is about 15 percent greater. Yields of wheat range from 15 to 30 bushels an acre and average about 18 bushels Yields of soybeans range from 18 to 30 bushels and average about 20 bushels (pl. 1, *B*). From 2½ to 4 tons of hay, or an average of 2¾ tons is obtained from alfalfa. Mixed hay averages about 2 tons an acre and clover about 1½ tons.

Woodmere silty clay loam, eroded phase.—This soil is similar to Woodmere silty clay loam in all respects, except that it has lost from 25 to 75 percent of the surface soil by erosion. Most of the small total area is in the vicinity of Vaughan. In places it borders the Ohio River. The fertility of this soil has been slightly reduced by erosion. Inherently, it is less suitable than typical Woodmere silty clay loam for clover and alfalfa.

Woodmere silty clay loam, gentle-slope phase.—This soil occurs in narrow strips on slopes of more than 3 percent. These slopes lead to small streams or sloughs. The surface of most areas of this soil ranges from 3 to 6 percent, although about 75 acres included in this phase have slopes ranging from 6 to 10 percent. It is similar to the typical soil in all respects other than slope. At present, it is farmed to the same crops and tilled under the same management as the typical soil with which it is associated. Some of this soil has lost as much as 25 percent of the surface soil, but this loss has not appreciably reduced the fertility. The crop yields are about the same as on Woodmere silty clay loam. It is more subject to erosion than the typical soil and will require good management if the fertility is to be maintained.

Woodmere silty clay loam, eroded gentle-slope phase.—This soil occurs chiefly south of Cypress bordering the Ohio River and in the vicinity of Vaughan. Only a few small areas are mapped. The surface slope ranges from 3 to 6 percent. The soil has lost from 25 to 100 percent of the neutral surface soil by erosion where the river has overflowed its banks. In places the reddish-brown subsoil is exposed. Although the ground is harder to work and lower in fertility than the typical soil, it is planted to corn and soybeans. Yields are about

25 percent lower than on Woodmere silty clay loam. If more green manures, such as soybeans, were turned under the tilth and fertility would be improved.

Woodmere silty clay loam, severely eroded gentle-slope phase.—This soil occurs in the vicinity of Vaughan on slopes of more than 3 percent. All of the surface soil and part of the subsoil have been washed away by the Ohio River when it broke out of its banks. Shallow gullies are numerous in all fields. Heavy floods frequently inundate the soil in the winter and spring. Much of this soil is lying idle, as a seedbed is difficult to prepare on the exposed subsoil materials. This soil might be reclaimed by the average farmer if the danger from floods could be removed.

Sciotoville silt loam.—Sciotoville silt loam occurs on old terraces of the Ohio River in the southeastern and southwestern parts of the county. It adjoins areas of Wheeling and Weinbach soils, being intermediate between them in position and drainage. It is seldom flooded except by extremely high waters, as in 1913 and 1937. The surface slopes are not more than 3 percent, which allow fair runoff. Internal drainage, however, is slow, owing to the presence of a claypan in the lower subsoil.

The surface soil to a depth of 8 or 10 inches is light grayish-brown friable silt loam underlain by a 5- or 6-inch layer of grayish-yellow slightly compact silt loam that contains numerous concretions of iron the size of a pinhead. The upper subsoil layer to a depth ranging from 16 to 20 inches is pale-yellow friable silty clay loam or heavy silt loam that breaks into angular and subangular fragments one-fourth to one-half inch in diameter. It also contains numerous concretions of iron the size of a pinhead. The lower subsoil layer to a depth ranging from 32 to 36 inches is grayish-yellow moderately compact silty clay loam mottled with gray and rust brown. This tight claypan layer hinders the downward movement of water. The material has a columnar structure and is slightly plastic when wet. It is underlain by gray and rust-brown mottled compact heavy silt loam or silty clay loam. This rests on the sandy substratum at a depth ranging from 60 to 80 inches. The underlying material consists of stratified layers of sand, silt, and clay. Mica flakes are perceptible throughout the soil but are especially pronounced in the substratum. The soil is very strongly acid throughout.

About 100 acres of soil that has a 1- or 2-inch layer of silty clay loam overlying the silt loam surface is included in this type. This material was deposited by the 1937 flood. The included area is in the southwestern part of the county near Bayou Creek. Where the Sciotoville soil joins Wheeling loam or Wheeling fine sandy loam, the surface is slightly lighter textured than is typical, as considerable very fine sand or fine sand is intermixed with it. Some of the soil is not eroded, although most of it has lost about 25 percent of the surface soil and, in a few included areas, it has lost from 25 to 50 percent.

Most of this soil is cleared and farmed. Some of it occurs in the urban section and is used for home sites and garden plots. Only a small area is in woodland. The crops grown are corn, wheat, and soybeans for cash, and lespedeza for seed and hay. Other minor crops include barley and alfalfa. The common rotations are corn, soy-

beans, wheat, and lespedeza or corn, soybeans, and wheat. Soybeans are occasionally turned under as green manure and then generally are followed by corn. Wheat and barley usually are the only crops for which fertilizer is used. Applications of 100 pounds of 2–12–16 fertilizer are most common. The usual range of acre yields of crops are as follows: Corn 25 to 40 bushels, wheat 12 to 22 bushels, soybeans 15 to 25 bushels, lespedeza for hay 1 to 1¼ tons, and barley 20 to 40 bushels. In exceptionally favorable seasons yields of corn of as much as 50 to 60 bushels have been reported for areas that were limed and that had a green-manure crop turned under. Estimated average acre yields for crops grown in rotation where fields of wheat or barley are fertilized are as follows: Corn 30 bushels, wheat 14 bushels, barley 25 bushels, soybeans 18 bushels, and lespedeza for hay 1 ton.

Yields of corn may be increased greatly by the use of lime, fertilizer, and green manures. Very little of this soil is limed.

Sciotoville silt loam, eroded gentle-slope phase.—This soil is associated with typical Sciotoville silt loam and occurs near stream banks on slopes ranging from 3 to 6 percent. A small total area is mapped, part of which lies in the urban section of the county. Most of this soil has lost from 50 to 75 percent of the surface soil, but about 10 percent has lost only 25 to 50 percent.

Some of the soil is lying idle, although most of it is cultivated. Probably less corn and more soybeans are grown than on typical Sciotoville silt loam, using the same management and rotations. Yields are about 20 percent lower, compared with those on the normal soil. Because of the greater erodibility of this soil, soil-conserving practices should be followed in farming. Plowing on the contour, planting close growing crops, and use of cover crops during the winter aid in checking erosion. Green manures and lime would improve the tilth and fertility of the soil.

Rahm silty clay loam.—Rahm silty clay loam is not so well drained as Woodmere silty clay loam with which it is associated. It occupies the flatter areas on low terraces adjoining the Ohio River flood plain, where it is subject to occasional inundation by high waters. The spring floods of 1913 and 1937 left thick sediments of sweet alluvial material over an acid soil developed from old alluvium. The buried soil appears to belong to the Weinbach series. This has resulted in a rejuvenated Weinbach soil which is recognized as Rahm silty clay loam. It is neutral in the upper layers and very strongly acid in the lower layers. Runoff from this soil is slow because of the nearly level surface. Internal drainage is impeded by the presence of a heavy claypan in the lower part of the subsoil.

The surface soil to a depth of 8 or 10 inches is dull grayish-brown or dull brownish-gray silty clay loam, neutral in reaction and containing some mica lenses. It is underlain by a 12- to 20-inch subsurface layer consisting of brownish-gray silty clay loam faintly mottled with rust brown in the lower part. This layer is slightly acid near the top and medium to strongly acid near the bottom where it overlies the old soil. Below this is a 7- or 8-inch layer of yellowish-gray and rust-brown mottled friable silt loam that is very strongly acid in reaction. This layer, in turn, is underlain by

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medium-gray or yellowish-gray compact silty clay loam that is mottled with rust brown and streaked with gray silt along vertical cracks. The material is moderately plastic when wet and breaks into small prisms or columns. It is more acid than the material in any other layer in this soil. At a depth ranging from 34 to 44 inches it passes into gray and rust-brown mottled compact silty clay loam that is plastic when wet and slightly less acid than the material above it. This layer becomes more lightly mottled and gray with increasing depth. The sandy substratum lies 10 to 12 feet below the surface. The lower strata to a depth of 25 feet consist of alternate layers of loose water-soaked sands and heavy silty materials, each 3 or 4 feet thick.

Most of the land is cleared, although a few areas remain in woodland. The trees include black oak, post oak, white oak, pin oak, sweetgum, shellbark hickory, persimmon, catalpa, sassafras, winged elm, white elm, redbud, and ash.

Corn, soybeans, and wheat are the principal cash crops grown on Rahm silty clay loam, although some hay is grown for livestock. The usual rotations are corn and soybeans or corn, soybeans, and wheat. No fertilizer is used, but occasionally soybeans are turned under as a green manure. Yields of corn usually range from 25 to 50 bushels an acre, depending on the season. Yields of 60 or 70 bushels of hybrid corn following soybeans have been reported in especially favorable years. In wet years the yields of corn are low. The estimated average for open-pollinated varieties of corn grown in rotation with soybeans is 30 bushels an acre. Under these conditions hybrid corn returns approximately 15 percent more than the open-pollinated varieties, on the average. Acre yields of wheat range from 12 to 25 bushels and average about 16 bushels, yields of soybeans range from 15 to 25 bushels and average 18 bushels (see pl. 1, *B*), and yields of timothy and clover hay average about 1½ tons.

The fairly good yields on this soil are due to the high fertility of the top layers. However, good yields cannot be perpetuated without proper management, which includes the use of legumes, green manures, fertilizer, and adequate drainage.

Weinbach silt loam.—Weinbach silt loam is an extensive slowly drained soil of the Ohio River terraces. It occurs on large flats where runoff is extremely slow and the soil is intermittently wet and dry for relatively long periods each year. Internal drainage is likewise slow, owing to the presence of a claypan in the lower part of the subsoil.

The 8- or 10-inch surface soil is brownish-gray friable silt loam, underlain to a depth ranging from 12 to 16 inches by yellowish-gray compact and friable silt loam faintly mottled with rust brown. The lower subsoil layer, which continues to a depth ranging from 22 to 26 inches, consists of light yellowish-gray and rust-brown mottled compact light silty clay loam. This material breaks into angular and subangular fragments from ½ to 1 inch in diameter. It is underlain to a depth ranging from 34 to 40 inches by gray and rust-brown mottled compact silty clay loam. This material is moderately plastic when wet and breaks into large blocky fragments that are coated with a film of brownish-gray material. Below this is grayish-yellow or yellowish-gray silty clay loam mottled with gray and rust

brown. At a depth ranging from 6 to 12 feet is the sandy substratum consisting of alternate layers of stratified sands and silts, each 2 to 4 feet thick. Mica lenses throughout this soil are characteristic. The reaction is very strongly acid. Near the junction of the Weinbach and McGary soils, the Weinbach soils appear to overlie calcareous silt and clay substratum of the McGary soils at a depth below 4 feet. This is observed in the southeastern part of the county, particularly near Pigeon Creek. The upper part of the soil is typical of the Weinbach series and is mapped with this type. About 100 acres of Weinbach silty clay loam occur in the vicinity of Bayou Creek and are included in this type. This latter soil appears to have a thin surface layer of silty clay loam probably left after the high flood of 1937. In the southeastern part of the county where areas of the Memphis soils join the Ohio River terraces a long narrow strip of colluvium overlying the soils of the Ohio River terraces is included in mapping because it resembled Weinbach silt loam in color and drainage of the upper layers. The surface of this colluvial soil to a depth of 12 to 14 inches is grayish-brown friable silt loam overlying a gray and rust-brown mottled silt loam or heavy silt loam. A few slightly eroded areas are also included in this type.

Some Weinbach silt loam occurs in the urban section where it is lying idle or is used for home and garden sites, some is in woodland, and the rest is cultivated. For successful production of crops the soil must be drained artificially, either by open ditches or by tiling. The crops grown include corn, wheat, soybeans, timothy and redtop, and lespedeza. Corn and wheat occupy the largest acreage. The usual rotations are corn, wheat, and soybeans; or corn and soybeans. Soybeans are occasionally plowed under as green manure. Wheatland usually is fertilized with 100 pounds of 2–12–6 fertilizer. Corn yields from 20 to 40 bushels an acre, wheat 10 to 20 bushels, soybeans 12 to 25 bushels, and hay 1 to 1¼ tons. These crops return average yields of about 25 bushels, 12 bushels, 18 bushels, and 1 ton, respectively. These yields are possible on soil in areas where adequate drainage has been provided and where the crops are rotated, and where fertilizer or manure is used for some crop in the rotation. Yields of crops are lower in extremely wet seasons. This soil is very strongly acid, and practically none of it has been limed. Better yields could be obtained if this soil was limed and more clover grown.

Ginat silt loam.—Ginat silt loam occupies shallow depressions and long narrow flat depressions or intermittent drainage channels on the broad terraces of the Ohio River, associated with Weinbach silt loam. It is the slowest drained soil of this group. Locally it is known as "buckshot land" because of the large number of iron oxide pellets scattered over the surface and throughout the upper part of the soil. Both surface and internal drainage of this soil are very slow. The soil is alternately wet and dry for long periods of time. Internal drainage is slow because there is a claypan at depths of 8 or 10 inches. Some of this soil is drained by open ditches.

The surface soil to a depth of 8 or 10 inches is light-gray or medium-gray friable silt loam containing some small iron concretions or mottlings of rust brown. It is underlain to a depth ranging from 18 to 22 inches by gray to light-gray compact silty clay loam that is streaked with rust-brown and gray silt along vertical cracks and root chan-

nels. This material has a coarse prismatic structure and is slightly plastic when wet. Below this layer and reaching a depth of 28 to 32 inches is gray heavy silty clay loam or silty clay that is profusely stained with rust brown along rootlet channels. This material breaks into coarse blocky fragments and is plastic when wet. It is underlain by a plastic silty clay of the same color but is more mottled with rust brown at lower depths. At depths ranging from 12 to 16 feet the soil rests on alternate layers of sands and clays or silty clays. The total area is small, and the soil generally is farmed in conjunction with Weinbach silt loam. The same crops and management apply to the two soils, but crop yields are somewhat lower in wet seasons on this soil than on Weinbach silt loam. On the average, corn yields about 18 bushels an acre, wheat 10 bushels, and hay 1 ton. The soil is very strongly acid and low in fertility. Better management practices would increase these average yields.

ALLUVIAL SOILS

Four subgroups of alluvial soils are recognized: (1) Slightly acid and neutral soils of the Ohio River flood plain, (2) acid silty soils of aggraded valleys, (3) slightly acid and neutral soils of aggraded valleys, and (4) soils derived from local alluvium. The soils of the Ohio River flood plain occupy the largest total area of the alluvial soils, followed in order by the other groups. All of these soils are subject to inundation by floodwaters.

SLIGHTLY ACID AND NEUTRAL SOILS OF THE OHIO RIVER FLOOD PLAIN

The slightly acid and neutral soils of the Ohio River flood plain comprise the Huntington, Boehne, Lindside, and Melvin series, and an undifferentiated type—sandy alluvium. The Huntington, Lindside, and Melvin soils are derived from slightly acid and neutral alluvium but differ in natural drainage conditions. The Huntington soils are well drained, whereas the Melvin are poorly drained. Lindside is intermediate in drainage between the two. The Huntington soils are brown to dark grayish brown and occupy the narrow well-drained ridges and slopes between sloughs. The Lindside soils are similar in color to the Huntington soils but become mottled with gray and rust brown from 14 to 24 inches below the surface. They occupy large flats and small intermittent drainageways. The Melvin soils are gray or brownish gray and are mottled to the surface. They border intermittent drainageways, which are wet for long periods during wet seasons. Some areas are wet all year, as water outlets are inadequate. Such areas are practically all wooded and mapped as Melvin silty clay. The Melvin soils are the last ones to dry and warm in the spring.

The Boehne soils have a surface soil similar to that of the Huntington soils and a loose sandy subsoil at a depth ranging from 12 to 24 inches, and for this reason tend to be droughty.

Sandy alluvium consists of sand smear ranging in depth from 12 to 60 inches laid down by recent floods over the Huntington or Lindside soils. This sand smear has greatly reduced the productivity of once fertile soils.

The alluvial soils are subject to periodic flooding during the winter and spring. Each flood of any magnitude deposits fresh alluvium over this flood plain, leaving the coarser textured material near the riverbank and the finer textured material farther inland. Fine mica flakes are present throughout.

Farming in these bottoms is adapted to the special conditions that prevail. Waters remaining on the ground until late in spring have necessitated the use of power machinery on the large farms in order to get the crops planted in as short a time as possible. Floods, however, seldom damage crops because they occur in the winter and spring when no crop is planted.

These bottoms constitute the cash-grain farming section of the county. Corn and soybeans are the principal crops raised and sold for cash. Generally, farm homes are built and livestock are kept farther north on higher ground rather than on these bottoms. The spring flood of 1937 washed away many farmhouses and buildings, livestock, and feed.

From the earliest times corn was the most important crop in the bottoms. Corn followed corn continuously and does at present on some areas. Better farming practice, however, calls for a rotation of soybeans and corn, which has proved a practical and profitable one. Fertilizer is not used and green manures are rarely used, although farmers who plow under a crop of soybeans report profitable increase in the yields of corn. These soils are naturally suited to clover and alfalfa, but the lack of a market and danger from late spring floods have discouraged the raising of these crops to any extent.

Huntington silt loam.—Huntington silt loam occurs near the Ohio River on well-drained low ridges and Huntington silty clay loam lies farther inland. In places, this soil adjoins areas of Huntington fine sandy loam. Small areas of Huntington very fine sandy loam are included with Huntington silt loam.

Huntington silt loam consists of brown or dark grayish-brown silt loam. At a depth ranging from 30 to 36 inches the color generally lightens to a medium grayish brown. In places the texture is a very fine sandy loam. The soil is underlain by stratified silts and silt loam materials. Fine flakes of mica are conspicuous throughout this soil. It is neutral or only slightly acid in all layers.

Huntington silt loam is the most productive soil of the Ohio River flood plain. It appears to be more recent in deposition than the silty clay loam and, consequently, is more fertile. This soil receives a thicker deposition of new alluvial material than Huntington silty clay loam, because it is close to the river. Its lighter texture makes it easier to work and it warms earlier in the spring than the heavier textured soils. All the land is cleared and devoted to crops, chiefly corn and soybeans. Corn yields from 35 to 70 bushels an acre although some fields yield as much as 100 bushels. Recently hybrid corn is being used more extensively. Adapted varieties will generally produce 10 to 15 percent more corn than open-pollinated varieties. The estimated average yield for open-pollinated corn in a rotation with soybeans is 50 bushels and hybrid corn 55 bushels. Soybeans yield 20 to 30 bushels, or an average of 25 bushels. A few fields of alfalfa are maintained, chiefly on included areas of Hunting-

ton very fine sandy loam. Yields of 3 to 6 tons of alfalfa are reported, or an average of about 4 tons.

Huntington silt loam, gentle-slope phase.—This soil occurs on the breaks of sloughs on slopes ranging from 3 to 6 percent, which are associated and farmed with the smoother areas of Huntington silt loam. Included with this soil are a few areas of Huntington very fine sandy loam. The total acreage of Huntington silt loam, gentle-slope phase, is very small. As on the typical soil, corn and soybeans are the chief crops. Yields and rotations are about the same as on that soil. This phase is subject to slight sheet erosion during torrential rains.

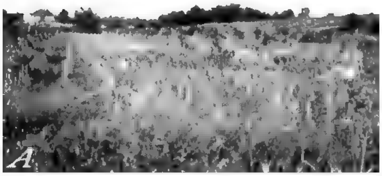
Huntington silty clay loam.—Huntington silty clay loam occurs farther inland from the Ohio River than the Huntington silt loam. Floodwaters here flow more slowly and allow the finer textured material to settle, whereas the coarser material has already settled near the stream banks. This soil occupies a relatively large total acreage of these bottoms. Its position on the tops of low narrow ridges and smooth slopes in association with Lindside and Melvin silty clay loams provides good external and internal drainage. Owing to the heavier texture of this soil, it is slower to warm in the spring and more difficult to work than the Huntington silt loam. In dry periods the surface bakes, becomes very hard, and cracks. Huntington silty clay loam is darker in color than Huntington silt loam. It has a dark grayish-brown silty clay loam surface, 10 or 12 inches thick, underlain by a dark grayish-brown compact but friable silty clay loam subsoil. Below a depth of 30 to 36 inches, the soil becomes slightly grayer. Very small concretions of iron were observed in places below a depth of 40 inches, and very fine flakes of mica are perceptible throughout this soil. The reaction is neutral in the surface soil and subsoil but in places becomes slightly acid below a depth of 40 inches.

All the land is cleared and cultivated. Corn (pl. 3, *A*) and soybeans are grown, generally in rotation. Both the open-pollinated and hybrid varieties of corn are grown. Hybrid corn is gaining in popularity, because it can be planted later and produces higher yields than open-pollinated varieties. Corn usually yields from 25 to 50 bushels an acre and soybeans 20 to 25 bushels. Larger yields of corn are reported for some fields in favorable seasons following a crop of soybeans plowed under. Estimated average acre yields of corn grown in rotation with soybeans is 35 bushels for the open-pollinated varieties and 40 bushels for the hybrid corn (pl. 3, *B*). Soybeans average 22 bushels an acre. Alfalfa should average about 3 tons.

Huntington silty clay loam, gentle-slope phase.—Areas of this soil are associated with the smoother areas of Huntington silty clay loam, but they occur in narrow strips on the breaks of sloughs on slopes ranging from 3 to 6 percent. The total acreage is small. These areas are farmed in conjunction with the smoother areas of Huntington silty clay loam. The crops grown and yields obtained are about the same as on the typical soil. The soil is affected by slight sheet erosion.

Huntington silty clay loam, slope phase.—This soil occurs in narrow strips on the banks of sloughs where the slopes range from

A, Corn on Huntington silty clay loam in Vanderburgh County; *B*, hybrid seed corn and soybeans on Huntington silty clay loam



A, Narrow bottom of Philo silt loam used for corn. Zanesville silt loam on slopes used for pasture, cultivated crops, and woodland. *B*, Corn in shocks, with wheat planted between, on Stendal silt loam. *C*, Algiers silt loam in northwest Vanderburgh County. Note recent light-colored alluvial deposits on dark-colored older soils. The pick handle is about 30 inches long.

6 to 10 percent. A small total area is mapped. It is all farmed to corn and soybeans just as the smoother areas of Huntington silty clay loam, but yields tend to be slightly lower, owing to lower moisture content and more rapid runoff with the consequent loss of some surface soil. Periodic renewal of the surface soil by floods has counteracted the bad effects of erosion to some extent. Yields should average about 20 percent below those of typical Huntington silty clay loam.

Huntington fine sandy loam.—Huntington fine sandy loam occurs near the Ohio River chiefly in the southwestern part of the county associated with Huntington silt loam. The total area is small.

The surface soil is brown fine sandy loam, underlain by a more compact but friable fine sandy loam or very fine sandy loam. Small mica flakes are conspicuous throughout. The reaction is slightly acid or neutral in all layers. Some of Huntington fine sandy loam represents a recent sand smear incorporated with Huntington silt loam. Such areas are slightly darker in color than the typical fine sandy loam. The sand smear, ranging in depth from 4 to 10 inches, has been plowed and intermixed with the old surface soil, resulting in a lighter textured but about as equally productive a soil as Huntington fine sandy loam. Where the sand smear is thick enough to reduce the productivity of the soil, the areas are mapped as sandy alluvium.

Some of this soil is in pasture and supports good stands of white clover and bluegrass. It is naturally suited to clover and alfalfa without the use of lime or fertilizers but is planted chiefly to corn and soybeans. Corn grown in rotation with soybeans should average 40 bushels an acre, soybeans 20 bushels, and alfalfa about 3 tons.

Boehne silt loam.—Boehne silt loam occurs near the Ohio River chiefly in the southernmost tip of the western part of the county and in smaller areas in the southeastern part. This soil adjoins areas of Huntington silt loam and resembles it in color. It is well drained because it has a very sandy subsoil. Included with the soil on the map are some small areas of Boehne very fine sandy loam which are not important enough to map separately.

As mapped, Boehne silt loam has a brown compact and friable silt loam or very fine sandy loam surface soil, from 12 to 24 inches deep. In places the lower part of the surface soil is a loam. The surface soil is underlain by light grayish-brown loose loamy fine sand grading into fine sand below a depth of 40 inches. Small mica flakes are conspicuous throughout this soil. It is approximately neutral in reaction.

This soil is farmed to corn and soybeans exactly as Huntington silt loam; but the average corn yields are considerably lower because this soil is droughty in dry seasons. Corn will fire early in the season unless rains are frequent. Acre yields of corn usually range from 20 to 40 bushels, or average about 25 bushels. Soybeans yield from 10 to 20 bushels an acre, or an average of about 15 bushels. Corn and soybeans are usually rotated, although corn follows corn in some places.

Boehne silt loam, gentle-slope phase.—This soil is associated with Boehne silt loam, but generally occupies slopes ranging from 3 to 6 percent. A few areas are included where slopes are steeper than 6

percent. Only a small total area is mapped. This soil is farmed in conjunction with the smoother areas of Boehne silt loam, and crop yields are about the same on the two soils.

Sandy alluvium.—Sandy alluvium borders the Ohio River. Where the rapid current of the Ohio River broke over the banks in 1937, it deposited a smear of sand over the fertile Huntington or Lindside soils. The coarseness and thickness of the alluvial material varies with the distance from the bank. In places on the bank deposits of 6 feet or more in thickness are common, but subsequent floods may remove these deposits or alter their thickness. During the floods of the winter of 1938 and 1939 many sand smears were scoured away, exposing the heavier textured soils.

Sandy alluvium represents a deposit of fine sand, loamy fine sand, or loamy sand, in most places from 12 to 72 inches thick. It is underlain by a 2- to 5-inch layer of mottled gray and rust-brown silt loam. The mottling in this layer has resulted from excessive moisture, which has percolated through the sandy layer. Below this layer is dark grayish-brown or brownish-gray silt loam containing numerous small flakes of mica. This soil is approximately neutral in all layers.

Most of the areas are level, although a few dunelike areas occur. A small acreage was mapped on slopes greater than 6 percent. This soil is not very suitable for raising corn and soybeans in its present condition. Yields of corn are very low, as the corn fires early in the season; an average yield of 15 bushels an acre is reported.

Lindside silt loam.—Lindside silt loam occurs near the Ohio River on broad flat areas between areas of Huntington silt loam and areas of Huntington and Lindside silty clay loams. This soil is intermediate in drainage between the well-drained Huntington and the slowly drained Melvin soils. Although its total acreage is relatively small, Lindside silt loam is one of the most productive soils of the cash-grain farming section. It is subject to periodic overflow and receives a deposition of alluvium with each heavy flood.

Lindside silt loam to a depth ranging from 14 to 24 inches is dark grayish-brown or dark brownish-gray friable silt loam. It is underlain by a brownish-gray silt loam that is mottled with rust brown. These mottlings increase with depth. This soil is neutral in all layers. Its lighter texture makes it warm earlier in spring and makes it easier to work than Lindside silty clay loam.

All the land is cleared and cultivated. Corn and soybeans are usually rotated, although in some places corn follows corn. Usually corn yields from 35 to 70 bushels an acre and soybeans 16 to 28 bushels. Estimated average acre yields for corn grown in rotation with soybeans are 45 bushels for open-pollinated varieties and 50 bushels for adapted hybrid varieties. Soybeans average about 22 bushels an acre. No fertilizer is used on these crops.

Lindside silty clay loam.—Lindside silty clay loam occurs on broad flats and along small intermittent drainageways associated with Huntington silty clay loam, which occupies the more sloping areas. It occurs farther inland from the Ohio River than Lindside silt loam. The flow of floodwaters here is relatively slow and allows the finer textured material to settle. Lindside silty clay loam is

intermediate in drainage between the Huntington and Melvin soils. Owing to its heavier texture, this soil is slower to warm in spring and more difficult to work than Lindside silt loam. In dry periods the surface soil bakes, cracks, and becomes very hard.

Lindside silty clay loam is dark grayish-brown or dark brownish-gray silty clay loam 14 to 24 inches deep. Below this is brownish-gray and rust-brown mottled silty clay loam that becomes grayer with depth. The substratum of gray and rust-brown plastic silty clay lies from 40 to 50 inches below the surface. The soil is approximately neutral in all layers.

All this land is cleared and cultivated. The crops grown are corn and soybeans, and to a small extent alfalfa. It is farmed in conjunction with Huntington silty clay loam and the same management practices are followed. In very wet years crop yields are slightly lower than on Huntington silty clay loam. Corn commonly yields from 20 to 50 bushels an acre, soybeans 15 to 25 bushels, and alfalfa 3 to 5 tons. Estimated average acre yields are as follows: Open-pollinated corn grown in rotation with soybeans 32 bushels, hybrid corn 38 bushels, soybeans 20 bushels, and alfalfa 3 tons.

Lindside silty clay loam, gentle-slope phase.—Areas of this soil are associated with the smoother areas of Lindside silty clay loam but occur in narrow strips on gentle slopes ranging from 3 to 6 percent. They are farmed in conjunction with the smoother areas of Lindside silty clay loam. The crops grown and yields obtained are about the same on the two soils.

Melvin silty clay loam.—Melvin silty clay loam occurs in long narrow strips in sloughs that are wet for a considerable part of the year and in slight depressions on broad flats. It is surrounded by Huntington and Lindside soils, which occupy higher ground. Melvin silty clay loam areas are the last to dry and be plowed in the spring. Frequently, this delay extends beyond the latest corn planting date.

Melvin silty clay loam is dark brownish-gray silty clay loam that is mottled with rust-brown to the surface. At a depth ranging from 14 to 24 inches this soil is underlain by gray and rust-brown mottled plastic silty clay that becomes increasingly mottled with rust brown as the depth increases. The typical soil is slightly acid to neutral in all layers. Farther inland from the river in sloughs that extend back into Woodmere and Rahm soils as well as depression areas surrounded by these soils, Melvin silty clay loam is medium to slightly acid and heavier in the lower layers. The following is a description of these inclusions. The 8- to 12-inch surface soil is a dark brownish-gray silty clay loam that is faintly mottled with rust brown. It is neutral in reaction and is underlain by gray and rust-brown mottled plastic silty clay or clay. The reaction is only slightly acid in the upper part, but it becomes increasingly acid until, below a depth of 30 inches, it is very strongly acid. The rust-brown mottlings likewise increase with depth. Crawfish holes are numerous on Melvin silty clay loam during wet periods. Drainage of depressed areas of Melvin silty clay loam is a problem. Tile drains are not very satisfactory, because they tend to plug with the heavy silty clay or clay. Probably open ditches would be more satisfactory because field observations showed corn to be growing well near these ditches.

Practically all of the areas of Melvin silty clay loam are cultivated. Corn and soybeans are grown as on the adjoining Huntington and Lindside soils, but yields are more variable. In fairly dry seasons yields of corn equal those obtained on Huntington or Lindside silty clay loams; in wet years, however, they are exceptionally low. The usual yields range from 15 to 40 bushels of corn an acre and 12 to 25 bushels of soybeans. The average is about 20 bushels of corn an acre and 15 bushels of soybeans. A corn-and-soybean rotation is not consistently adhered to on Melvin silty clay loam as weather conditions frequently determine which of these two crops shall be planted.

Melvin silty clay.—Melvin silty clay is mapped on the Ohio River flood plain in permanently wet sloughs. In their present condition, these areas are not suited for agriculture, and practically all of them are wooded. The dominant trees are cypress (see pl. 1, *B*) and swamp cottonwood. Other trees include black willow, red maple, silver maple, blue beech, cow oak, overcup oak, swamp white oak, and black alder.

Melvin silty clay is similar to Melvin silty clay loam but is more intensely mottled with rust brown in the upper layers. Recent floods have left a deposit of silty clay loam material on some areas, but these are included in this type because of similar agricultural adaptations. The total area of this soil is small.

ACID SILTY SOILS OF AGGRADED VALLEYS

Acid silty soils are common in broad flat valleys and on the small bottoms near the heads of streams throughout the hilly and rolling uplands of the county. These bottoms are being continually filled with silt material from the adjoining uplands and for this reason they are designated as aggraded valleys. Well drillings show these alluvial silts to range in thickness from a few to more than 100 feet. The soils in these bottoms are Philo, Stendal, and Waverly silt loams. They are all acid in the upper layers. Waverly silt loam is the slowest drained and Philo silt loam the best drained soil of this group. The Philo soil, however, is not perfectly drained. Pope silt loam is the well-drained soil mapped under such conditions associated with these soils in the other parts of Indiana, but the few acres of Pope silt loam occurring in this county are too small to show on the map. Stendal silt loam is intermediate in drainage between Philo and Waverly silt loams. These soils are all subject to overflow, but floods seldom occur during the growing season and do not often destroy the crops.

These soils are agriculturally important in the dairy- and general-farming sections of the county. On many farms of the hilly sections they constitute the only smooth land available to raise the necessary feed for stock. They are suitable for the raising of most crops of the region including corn, wheat, timothy, lespedeza, and soybeans. Good yields can be obtained where adequate drainage is provided, where lime and fertilizer are used, and where crops are rotated.

Philo silt loam.—Philo silt loam occupies a relatively small proportion of the area of the soils included in this group. It is associated with Stendal and Waverly silt loams but is better drained

than either. Generally it adjoins the stream channels. Much of this soil occurs in the small bottoms near the heads of streams surrounded by the Zanesville, Hosmer, and Vanderburgh soils (pl. 4, *A*). Here, local alluvium from the adjacent hills has built up a soil that is well drained in the upper layers.

Philo silt loam has a grayish-brown silt loam surface soil, from 18 to 24 inches deep. It is underlain by grayish-yellow friable silt loam that is mottled with gray and rust brown. The proportion of gray and rust-brown mottlings increases with depth. The underlying substratum consists of stratified layers of silt or in places silt and sand. The reaction is strongly acid throughout. Included with this type are a few areas having a very fine sandy loam surface soil.

The same crops are grown on this soil as on Stendal silt loam. Yields of corn are about the same on the two soils, although yields of wheat and soybeans are slightly higher on the Philo soil, owing to better drainage. Corn yields from 25 to 50 bushels an acre, or an average of approximately 35 bushels; wheat 12 to 25 bushels, when fertilized, or an average of 15 bushels; soybeans yield 1 to 2 tons of hay, or an average of 1½ tons; and soybeans for grain 12 to 25 bushels, or an average of 17 bushels. Cornland is occasionally fertilized, and wheatland is nearly always fertilized. The land needs lime in order to grow clover.

Stendal silt loam.—Stendal silt loam occurs along Locust and Little Pigeon Creeks and the tributaries of Bluegrass and Big Creeks. It is one of the most extensive soils of this group and occurs on broad imperfectly drained flats. It adjoins Waverly silt loam, which is even more slowly drained. Overflows occur sometimes, although seldom during the growing season.

The 10- or 12-inch surface soil of Stendal silt loam consists of brownish-gray silt loam faintly mottled with rust brown. It is underlain by yellowish-gray or gray friable silt loam, containing rust brown mottlings that increase with depth. The reaction is strongly acid. Some areas having a very fine sandy loam surface soil are included with this soil in mapping.

Most of this land is cleared and farmed, and only a small part is wooded. Corn and hay are the principal crops, although some wheat is grown on better drained fields (pl. 4, *B*). Soybeans or cowpeas are commonly cut for hay. Cornland is frequently fertilized or manured, particularly if wheat is not grown in the rotation. Wheatland commonly receives 100 to 125 pounds of 2–12–6 fertilizer. Corn yields from 20 to 50 bushels an acre, or an estimated average of 35 bushels; wheat 10 to 25 bushels, or an average of 12 bushels; and soybeans 1 to 2 tons of hay. If no fertilizer is used or no rotation is followed, the average yields are much lower. Most of this soil needs lime because it is strongly acid. Clover does well on limed fields. After liming, rotations of corn, wheat, and clover are practical. The use of clover in the rotation aids in building up the fertility of this soil.

Waverly silt loam.—Waverly silt loam is the most slowly drained soil of this group. It occurs in the larger stream bottoms, away from the stream channel. The largest areas are mapped along the tributaries of Bluegrass Creek in the northeastern part of the county,

although other areas occur also on Locust Creek, Little Pigeon Creek, and South Fork of Big Creek.

Waverly silt loam has a light-gray friable silt loam surface soil 10 or 12 inches deep. It is underlain by light-gray and rust-brown mottled compact but friable silt loam. In places at a depth ranging from 36 to 72 inches the underlying substratum is slightly more compact and heavier in texture. The upper layers of the soil are very strongly acid, but the substratum is not so acid. Scattered over the surface are numerous pellets of iron oxide. Crawfish holes are numerous in areas that are not adequately drained.

Some of the land is wooded; the rest is cleared and cultivated. Artificial drainage is necessary for the successful production of crops. Much of the land is used for pasture. Corn, soybeans, and hay are the principal crops, although some wheat is grown on better drained fields. In dry years the yields of crops equal those obtained on Philo and Stendal silt loams, but in wet years yields are low. Overflows occur, although usually in the winter and early spring. Overflow waters during the growing season usually do not remain on the ground for more than a few hours. Corn yields from 10 to 50 bushels an acre, or an average of about 20 bushels; soybeans 10 to 20 bushels, or an average of about 12 bushels; soybeans, 1 to 2 tons of hay, or an average of about 1¼ tons; other hay, including lespedeza or timothy and redtop, ¾ to 1½ tons, or an average of about 1 ton. Some areas of Waverly silt loam have been limed, although most of it has not been. Fertilizer or manure, if available, are occasionally used on cornland. This soil furnishes fairly good pasturage.

SLIGHTLY ACID AND NEUTRAL SOILS OF AGGRADED VALLEYS

Adler silt loam, Inglefield silt loam, and Algiers silt loam comprise the group of slightly acid and neutral soils of aggraded valleys. Adler and Inglefield silt loams are closely associated and are developed from sweet silty alluvium. They occur principally in the southwestern part of the county along small streams that originate in areas occupied by the Memphis and Vanderburgh soils. In many places they adjoin uplands whose lower slopes have some thin limestone rock outcrops, or they adjoin the McGary or Markland soils, which have calcareous parent materials. Algiers silt loam occurs chiefly in the northern and northwestern parts of the county. This soil consists of an overwash of grayish-yellow or brownish-gray alluvium over moderately dark-gray Montgomery or Ragsdale soils. It is generally slightly acid in the light-colored layers and neutral in the dark-colored layers. All these soils are devoted to crops, principally corn, soybeans, and hay, and, to a lesser extent, wheat. Their almost neutral reaction makes them naturally adapted to clover. They are subject to overflow, but principally from local hill wash rather than from creek backwaters. These soils are important agriculturally in the hilly sections where they are the chief soils used to produce most of the required grain crops.

Adler silt loam.—Adler silt loam covers a small total area along stream channels, principally in the southwestern part of the county. It is a relatively well-drained soil developed from sweet alluvium.

It resembles Philo silt loam in color and texture of layers but differs from it in being about neutral in reaction. Apparently, Adler silt loam has developed from alluvium of more recent origin than has Philo silt loam.

The grayish-brown silt loam surface soil is 14 to 24 inches deep. It is underlain by brownish-gray or yellowish-gray friable silt loam mottled with rust brown. Below a depth of 30 to 36 inches the mottlings of gray and rust brown become more intense. The underlying substratum consists of stratified layers of silt and very fine sandy loam. The reaction is about neutral in all layers. In places the soil mapped as Adler silt loam is more nearly a very fine sandy loam. The textural variation occurs where the soil is influenced by local wash from the Vanderburgh soils.

Adler silt loam is planted to crops of corn, wheat, soybeans, and red clover. Corn yields from 30 to 60 bushels an acre, or an average of about 40 bushels; wheat 12 to 25 bushels, or an average of 16 bushels; soybeans 18 to 30 bushels, or an average of 20 bushels; and red clover 1 to 2 tons of hay, or an average of 1.6 tons. Wheatland usually is fertilized with 100 pounds of 2–12–6 fertilizer. The average yields of grain apply to crops grown in rotation with a legume.

Inglefield silt loam.—Inglefield silt loam is associated with Adler silt loam, principally in the southwestern part of the county. It is an imperfectly drained soil resembling Stendal silt loam but differs from it in having an approximately neutral reaction in the upper layers. Like Adler silt loam, Inglefield silt loam appears to be developed from recently deposited alluvium.

The surface soil of Inglefield silt loam to a depth ranging from 8 to 14 inches is grayish-yellow or brownish-gray silt loam faintly mottled with rust brown. In some places iron or manganese oxide concretions are present in the lower part. It is underlain by light yellowish-gray or light-gray silt loam highly mottled with rust brown. In many places dark-brown and black concretions of iron and manganese are present throughout this layer. The gray color and rust-brown mottlings increase with depth. The underlying substratum consists of stratified layers of gray silt. Included with Inglefield silt loam are about 70 acres of a more poorly drained soil that is slightly grayer throughout. In places where Inglefield silt loam is influenced by wash from Vanderburgh soils, the surface texture is a very fine sandy loam. Such areas are small, however, and irregularly distributed.

Most of this land is cleared and used for growing crops—chiefly corn, wheat, soybeans, and clover—or pasture. A small area is in woodland. The usual rotations on adequately drained land are corn, wheat, and clover; or corn, soybeans, wheat, and clover. To a lesser extent the rotations of corn and soybeans or corn following corn are used. Wheatland usually is fertilized with 100 pounds of 2–12–6 fertilizer to the acre. In a regular rotation on well-drained land, yields of corn usually range from 20 to 50 bushels an acre and average about 35 bushels; wheat 10 to 25 bushels and average about 12 bushels; soybeans from 10 to 25 bushels and average about 18 bushels; and clover 1 to 2 tons and average about 1.5 tons. Areas

that are in pasture support good stands of bluegrass and white clover. Areas that remain poorly drained would not give so high average yields as mentioned.

Algiers silt loam.—Algiers silt loam occurs principally in the northern and northwestern parts of the county on the lake plains. The largest strip is mapped along Pond Flat Ditch, a tributary of Flat Creek. It is associated principally with Alford, Iona, and Ayrshire soils, although in places it adjoins areas of Zanesville soils. Algiers silt loam is subject to occasional overflow.

The surface soil of Algiers silt loam consists of a 6- to 16-inch overwash of grayish-yellow or brownish-gray silt loam which is medium acid in reaction. It is underlain by a 6- to 8-inch transitional layer of medium-gray silt loam that is stained with rust brown along rootlet channels and is slightly acid in reaction. Below this layer is moderately dark-gray friable heavy silt loam showing rust-brown staining along rootlet channels (pl. 4, *C*). This layer is neutral in reaction and fairly high in organic matter. It reaches to a depth ranging from 40 to 50 inches. The substratum consists of gray and rust-brown mottled silty clay loam that is slightly plastic when wet and generally neutral in reaction. The boundary between the substratum and the overlying darker layer is not sharp. Tongues of dark-gray silt penetrate into the substratum. A few areas mapped as Algiers silt loam have a slightly lighter color in the lower layers than that just described.

Most of this soil is cultivated. It is especially well suited to corn and clover or for pasturage. Corn yields usually from 40 to 80 bushels an acre, or an average of about 50 bushels; soybeans 15 to 30 bushels, or an average of 20 bushels; and clover 2 to 3 tons, or an average of about 2 tons.

SOILS DERIVED FROM LOCAL ALLUVIUM

Local alluvial material has collected in many places where the footslopes of hills meet the level alluvial places. These deposits are the result of surface wash and soil creep from higher slopes to lower levels. Algiers silt loam, colluvial phase, Keyesport silt loam, and Memphis silt loam, colluvial phase, are the members of this group.

Algiers silt loam, colluvial phase.—Algiers silt loam, colluvial phase, an inextensive soil, occurs in the northwestern and southeastern parts of the county on flat or gently sloping bottoms adjoining the uplands. It receives local wash from uplands where the Alford, Iona, and Memphis soils dominate. The local recently deposited material on this soil ranges in thickness from 6 to 24 inches and is comparable in color to the overwash on typical Algiers silt loam. It consists of light grayish-brown, grayish-yellow, or brownish-gray friable silt loam and is moderately to slightly acid in reaction. The lower layers are the same as in Algiers silt loam. This soil differs from Algiers silt loam only in that it receives a deposit of local alluvium washed from the adjacent hillsides and is not subject to flooding by overflow waters from larger streams.

It is planted to the same crops and is managed in much the same way as typical Algiers silt loam. Yields are about the same as on

that soil, except that they are better in those years when crops are damaged by floods on typical Algiers silt loam. This soil is probably slightly better suited to wheat because of its higher position. Some wheat is raised. Yields ranging from 15 to 30 bushels an acre are reported with the use of about 100 pounds of 2–12–6 fertilizer; the estimated average yield is 18 bushels.

Keyesport silt loam.—Keyesport silt loam is an extensive and important agricultural soil. It is widely distributed in the county on alluvial fans between the foot of slopes and stream bottoms or terraces. It is imperfectly drained because of the low gradient. It receives frequent depositions of silty materials from the adjacent hills during heavy rains whenever the hill areas are not protected against erosion, but it is not subject to overflow from the larger streams.

To a depth ranging from 8 to 16 inches Keyesport silt loam is grayish-yellow or light brownish-gray silt loam, faintly mottled with rust brown. This is underlain to a depth ranging from 36 to 50 inches by light-gray or gray compact but friable silt loam that is mottled with rust brown. Below this depth is gray or yellowish-gray heavy silt loam mottled with rust brown. At a depth ranging from 50 to 60 inches, this grades into a compact silty clay loam substratum of the same color. The soil is medium acid in the surface soil and medium acid to neutral in the subsoil. A few small areas with a very fine sandy loam surface soil are included in mapping. In the lake-plain areas where this soil is associated with Peoga silt loam, it apparently is an overwash of local alluvium over that soil.

Practically all of Keyesport silt loam is planted to corn, wheat, soybeans, and hay. Only a small area is in woods. The usual rotations are corn, wheat, and hay; or corn, soybeans, wheat, and hay. Wheatland is commonly fertilized with 100 to 125 pounds of 2–12–6 fertilizer to the acre. Hay is principally lespedeza or timothy and redtop. For successful production of crops the land generally is drained by tile or small ditches. Corn yields from 25 to 50 bushels an acre, or an average of about 30 bushels; wheat 12 to 30 bushels, or an average of 18 bushels; soybeans 12 to 25 bushels, or an average of 17 bushels; and hay 1 to 1½ tons, or an average of 1¼ tons. Most of the land needs some lime in order to grow clover. Higher yields of corn can be obtained by the use of manure or fertilizer, but the average yield is lowered by poor yields in extremely wet years.

Memphis silt loam, colluvial phase.—Memphis silt loam, colluvial phase, occurs as a narrow strip at the base of Memphis soils and adjoins the soils of the Ohio River terraces. Only a very small area is mapped, principally in the southeastern part of the county. It is derived from local alluvium washed from the Memphis soils and spread out over the adjoining terraces as a sort of alluvial fan. In this respect it is similar to Keyesport silt loam and Algiers silt loam, colluvial phase, but it is better drained internally and externally than the Keyesport soil. It differs from Algiers silt loam, colluvial phase, in that the layers underlying the overwash consist of a gray and rust-brown mottled acid soil, rather than a dark-

colored neutral soil. If Memphis silt loam, colluvial phase, were more extensive, the reaction of the underlying substratum would probably be variable, as it is in the Keyesport soil.

The surface soil of Memphis silt loam, colluvial phase, is light grayish-brown or light-brown mellow silt loam, 10 or 12 inches thick, neutral in reaction. It is underlain to a depth ranging from 16 to 30 inches by light brownish-yellow loose and friable silt loam that is likewise neutral in reaction. Below this layer in most places is a 3- to 10-inch layer of yellowish-gray or brownish-yellow and gray mottled silt loam, having a very thin platy structure. It is slightly acid to neutral in reaction since it is a transitional layer between the newly deposited material and the underlying acid substratum. The underlying material is gray and rust-brown mottled compact silt loam material, very strongly acid in reaction.

Some of this soil occurs in the urban section and is used for garden plots. The rest is planted to corn, wheat, and clover. Owing to its small extent, adequate information on crop yields is not available, but field observation and soil characteristics indicate that this soil should be slightly more productive than Keyesport silt loam. It is particularly good soil for corn and clover. Estimated average yields on an acre for various crops are as follows: Corn 40 bushels, wheat 18 bushels, hay 1¾ tons, red clover 1½ tons, alfalfa 2½ tons, soybeans 20 bushels, and potatoes 100 bushels. No fertilizer is used except on wheatland.

MISCELLANEOUS LAND TYPES

Made land.—Made land comprises areas that have been filled in by refuse, soil material, or coal-mine waste. Most of these fills have been leveled off to the level of the adjoining areas. This land has no agricultural value, but it can be used for home sites. Most of the earth fill is in the urban section.

Borrow pits.—Borrow pits consist of areas that have been stripped of their upper soil layers in order to provide earth for roadbeds, levees, or other types of embankments. These occur only on the bottoms of the Ohio River. Most of the borrow pits are now depressed areas without adequate external drainage. Water stands in many of them. Some of the adequately drained shallow pits can be used for raising crops, as the remaining alluvium is fairly fertile. In time all such areas could be reclaimed for farming, as they consist of alluvial soil materials.

Riverwash.—Riverwash consists of areas of coarse sand and gravel on the river front. It is part of the riverbed during high waters. Willows grow on some of the areas.

LAND USE AND SOIL MANAGEMENT

The soils of Vanderburgh County have been broadly grouped into three classes on the basis of the best land-use capabilities: (1) Cropland, (2) pasture land, and (3) forest land; utilizing the most productive land for crops and the submarginal land for pasture and

View looking west from Cynthiana road over NW¼ sec 21, T 5 S., R 11 W , showing soils 1, Za
phase; 4, eroded slope phase; 5, severely eroded slope phase; 6, Vanderburgh silt loam; 7, hil
eroded hill phase; 10, severely eroded phase; 11, very steep phase; 12, rough gullied land (Vand

Same view as in plate 5, showing land use. 1 Cropland—*a*, corn, *b*, wheat *c*, soybeans *d*, idl… *f*, potatoes, *g*, berry brambles *h*, fruit trees 2 Pasture—*a*, lespedeza, *b*, other pasture 3, For… land; *c* land destroyed for cropping by erosion 4. Farm buildings and lots

forestry. This is desirable for economical farming as well as for conservation of the soil.

Cropland has been further subdivided on the basis of productivity. Productivity of any soil is the product of fertility as conditioned by such factors as climate, slope, drainage, and management. Slope in turn affects the speed of surface water runoff and the workability of the land.

Pasture land consists of areas that are too steep or too eroded to be farmed continuously with the production of fair yields of the crops of the region. It is submarginal land that is idle or is being farmed in conjunction with smooth areas. Wherever it is cultivated to row crops, erosion goes on at an accelerated rate.

Forest land is land that is too steep, too eroded, or too poorly drained for cultivation or pasture. Erosion is very serious on the exposed steep areas, and the soil should be protected by a surface cover and trees.

Obviously all good cropland in this county also would make good forest land, but, where intensive farming is to be carried on in order to realize the quickest returns from the land, it becomes necessary to utilize the best land for crops and to allow areas that are not suitable for profitable cultivation to revert to forest or remain in timber.

A generalized soil map (see fig. 2) shows the geographic location of the principal soils and the soils associated with them. Figure 3 shows the present major land use and types of farming existing within the county. This was drawn up from facts observed in the field and corroborated by the county agent or his assistants. The boundaries in general follow those of the principal soils. A comparison of the two maps shows what soil types predominate or are important in each farming area.

The general-farming area, covering the largest amount of acreage has been subdivided into the northern-hill section and the southern-hill section; the line of division corresponding with the boundary between the Memphis-Vanderburgh and Hosmer-Zanesville-Vanderburgh soil associations. The northern-hill section has been highly dissected by streams leaving long narrow ridges with steeply sloping hillsides. Erosion has been severe and large areas of rough gullied land remain. Plates 5 and 6 are oblique aerial views of the hilly section. Farming is confined to the narrow ridge tops of Hosmer and Zanesville soils and to the alluvial soils, consisting of Waverly, Stendal, and Philo silt loams. The steep hillsides are eroded phases of Vanderburgh silt loam, which are not cultivated but are lying idle.

Plate 5 shows the soils of this area mapped in detail on the oblique aerial photograph, and plate 6 shows the present land use on another copy of the same photograph. From these illustrations it is seen (1) that field lines are rectangular in shape and do not follow the soil or slope pattern, (2) that large areas of soils, that are seriously eroded, are used for crops, (3) that large areas of idle or brush land are seriously eroded and should be reforested, and (4) that clean-cultivated crops make up a large proportion of the crops

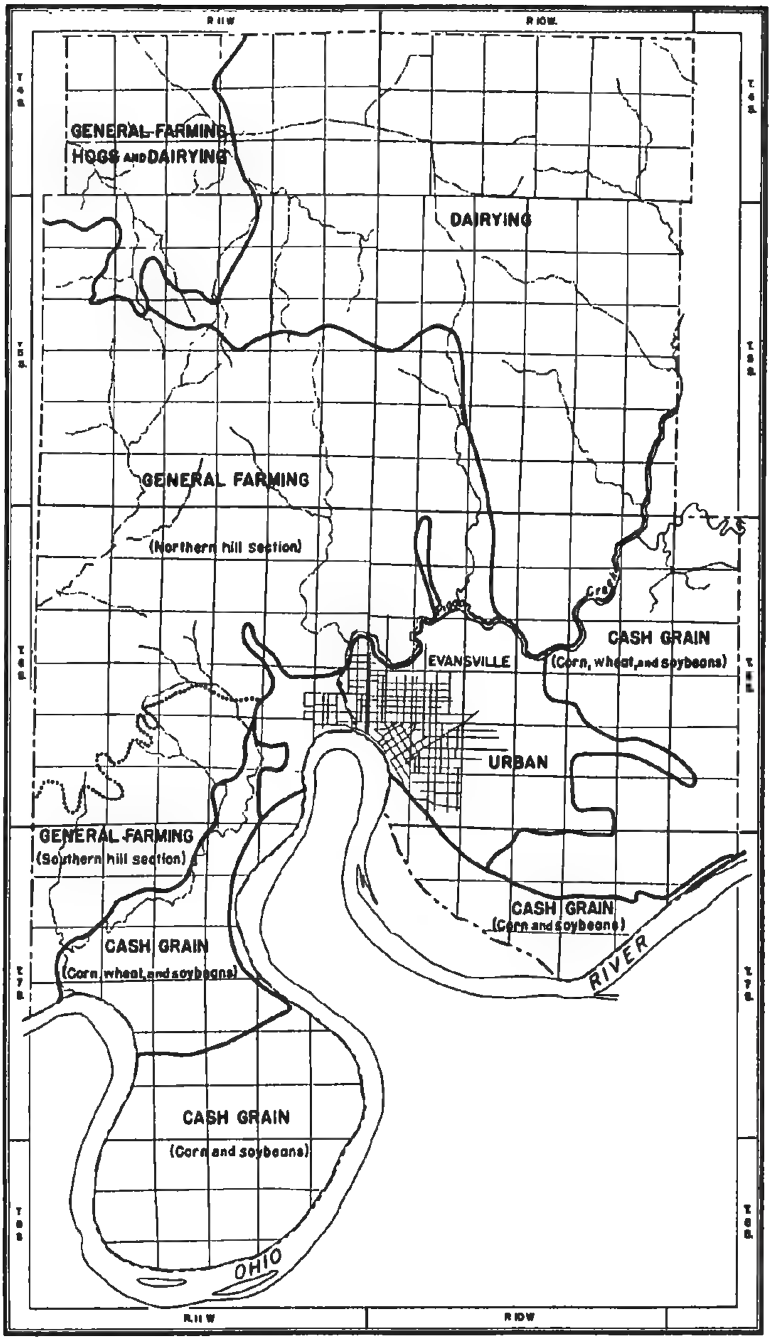


FIGURE 3.—Land use and types of farming in Vanderburgh County, Ind.

grown. All these observations together with the poor quality of permanent pastures indicate a lack of soil-conserving practices or any soil-conserving program.

Most of the farms in this general-farming area are small. A large number of small holdings in the southern part of this area should not be classified as farms, because they are merely country home sites or a part of the suburban section of the city of Evansville. On the smaller farms, truck farming has become the chief agricultural enterprise. This is especially true in the eastern part of this area, where there are many greenhouses that once were important for lettuce raising. After commercial truck farming began, however, the market in the nearby city of Evansville was lost.

Small orchards of apple, peach, or pear trees are a part of almost every farm, and in addition there are several commercial orchards in this section. The farm fruit trees are usually located on the shallowest and most unproductive soils, and, except in the commercial orchards, little or no effort is made to improve the yields or quality of fruit by pruning, spraying, or fertilizing.

The other crops grown in this general-farming area are soybeans, wheat, corn, and lespedeza. A few milk cows and hogs are kept on most of the farms in order to supply milk and meat for home needs.

The southern-hill section is comprised of some of the roughest land of the county. The line of separation between the northern-hill section and southern-hill section corresponds approximately to the northern limit of Memphis silt loam. Associated with the Memphis soil, but on steeper slopes, are the Vanderburgh soils. On the narrow bottoms are Inglefield and Adler silt loams that are sweet in reaction. Large areas of the steepest land are in woodland. General farming as described in the northern-hill farming section is carried on here, and truck farming is important in the areas near Evansville. There are many scattered fields of alfalfa on the smoother areas of Memphis silt loam, which is particularly adapted to alfalfa because of its friability. However, its deficiency in lime must be corrected.

Dairying predominates in the second largest agricultural area of the county, which is located in the northern and eastern parts. The boundaries of this area do not correspond to the boundaries of any soil group, but include parts of several soil groups. (Compare figures 2 and 3.) No doubt economic factors, such as the ready market for milk in the city of Evansville, are of primary importance in determining the type of farming carried on here. The area is not so uniformly hilly as that on the west and includes large areas of relatively smooth land. The smooth land is well suited for the production of the necessary stock feed, whereas the hilly land is better for grass and pasture. This does not mean that the present land use conforms to any pronounced degree with the land-use capabilities as presented in the productivity tables (see tables 9 and 10). The soils on the rolling uplands are dominantly Hosmer, Zanesville, and Vanderburgh silt loams, the first two occupying the ridge tops and the latter the steeper hillsides. The Hosmer and Zanesville soils are generally cultivated, but most areas of the Vanderburgh soils are too steep or too eroded to make cultivation profitable. Large areas of the Tilsit and Johnsburg soils (group *C* on general soil map, fig. 2, p. 38)

are included. These soils have gentle slopes and are well adapted for the raising of grain and hay to supply feed for dairy cattle. The wide bottoms and lake flats consist of Keyesport, Waverly, Stendal, Philo, and Peoga soils, which are generally acid in reaction but are fairly productive. Most of these soils are imperfectly drained, but they have been reclaimed by ditches or tile drains. In the southern part of this area, the soils of group *E* (fig. 2, p. 38) predominate. This group includes McGary, Montgomery, Zipp, and Markland soils, which, with the exception of Markland silt loam, occupy nearly level areas. This fact, together with the large size of the areas in each farm, is conducive to large-scale power farming. These soils are among the most productive in the county and produce high yields of grain and red clover. The principal crops raised are corn, wheat, and hay; the latter consisting of timothy and redtop, lespedeza, soybeans, and alfalfa.

The northwestern part of the county is devoted to general farming, hog raising, and dairying. A self-sufficing type of farming is carried on under intensive management practices, which include the use of lime, fertilizer, manure, and red clover grown in rotation and result in high acre yields of the crops raised. The principal sources of cash income are from the sale of hogs and wheat. Dairy products supply home needs, and the proceeds from their sale supplements other sources of income. Corn, wheat, and hay are the principal crops grown, the latter consisting of clover, timothy and clover, alfalfa, lespedeza, and soybeans. Pastures are chiefly rotational. The corn and hay grown are generally fed to the stock.

The farming soils of this area (fig. 2, *A*) consist of Alford, Ayrshire, Iona, Ragsdale, and Zipp silt loams, together with small areas of alluvial soils occurring on the bottoms. These soils, with the exception of Alford, occupy level or gently sloping areas and are very silty in texture. The smooth terrain is due to the presence of old glacial lake deposits. The Ayrshire, Ragsdale, and Zipp soils are poorly drained in their natural state, but by artificial drainage they have all been reclaimed for cropping. At present they are among the most productive soils of the county. Ragsdale and Zipp silt loams are dark-colored soils that are high in organic matter and nearly neutral in reaction. They produce the crops grown without the use of fertilizer and are naturally adapted to red clover. The alluvial soils are inextensive in this section. They include chiefly Algiers, Lyles, and Stendal soils.

Cash-grain farming is carried on in the southern part of the county south of Pigeon and Bayou Creeks. This area has been divided into two sections on the basis of the crops grown: (1) The corn, wheat, soybean section, and (2) the corn and soybean section (fig. 3). The line of separation coincides with the boundary between the old terraces and the present flood plains of the Ohio River.

In addition to the main crops of the corn, soybean, and wheat section hay is grown to a smaller extent and is used principally to feed livestock. Most of the farmers keep only enough livestock to supply home needs for milk and meat, although there are a few dairy and hog farms. The fact that most of the land is level or

gently sloping and is held in large tracts makes large-scale power farming practicable.

Three different groups of soils comprise the farming land in the corn, wheat, and soybean section as can be seen by reference to the generalized soil map (fig. 2, p. 38).

The most productive soils are those of group *E* occurring in the northern part. They comprise the McGary, Montgomery, Zipp, and Markland soils, which are derived from old slack-water deposits. Montgomery and Zipp soils are dark colored, high in organic matter, and nearly neutral in reaction. Well suited to clover, they produce most of the clover grown in this area. The rotations are corn, soybeans, and wheat; or corn, soybeans, wheat, and clover. Clover is fed to home livestock or frequently is turned under as a green manure. In the eastern part of the county on these same soils, some tomatoes are grown and are sold to a cannery in Evansville.

The second group of soils (group *G*, fig. 2) includes Wheeling, Sciotoville, Weinbach, and Ginat soils. These soils are developed from old alluvial materials deposited by the Ohio River. They are acid in reaction and not naturally suited to clover. Lespedeza is generally grown for hay. Farming operations are concentrated on the production of cash crops—corn, wheat, and soybeans. Better yields could be obtained if the land were limed and more green manures turned under. When limed, Wheeling loam makes a good soil for alfalfa because of the friable subsoil.

The third group of soils (group *H*, fig. 2) includes Woodmere and Rahm silty clay loams. They appear to be rejuvenated Wheeling, Sciotoville, and Weinbach soils. Excessively high waters, such as the 1913 and 1937 floods, have left sufficient deposits over these old soils to produce new soil types whose productivity is greater than the Wheeling, Sciotoville, and Weinbach soils. The upper layers of these soils are nearly neutral in reaction; consequently, alfalfa will grow where seeded. In spite of this, not much alfalfa is grown in proportion to corn, wheat, and soybeans.

The corn and soybean section of the cash-grain farming area includes only the alluvial soils along the Ohio River. (Compare figures 2 and 3.) The character of the soils, the lay of the land, and the danger from winter flooding make this section best suited to the growing of cash crops, as these can be grown and matured during the growing season. The soils here are among the most fertile in the county and are especially adapted to corn and soybeans. A small quantity of alfalfa is grown, but practically no wheat. Yields of alfalfa are among the highest in the county whenever the stands are not damaged by floodwaters remaining on the land during the early warm spring.

The soils include Huntington, Lindside, Melvin, Boehne soils, and sandy alluvium. The Huntington soils occupy the well-drained higher areas, Lindside the imperfectly drained areas on flats or intermittent drainageways, and Melvin the slowly drained areas, generally sloughs. The Boehne soils have a sandy subsoil and are more droughty than the Huntington, Lindside, and Melvin soils. The sandy alluvium is a sand smear 10 inches or more thick over Hunt-

ington or Lindside soils, and it is the least productive soil of this group.

Under the better management practices corn is grown in rotation with soybeans, although corn follows corn on many farms in this section. The practice of turning under soybeans is not a common one, although a few reports from the county agent indicate that such a practice is profitable. The land is generally burned over in spring to get rid of river debris and cockleburs.

Floods, such as those of 1913 and 1937, have washed away many of the buildings in these bottoms. The few farm homes remaining are protected with levees built around the houses. For 1 or 2 years following the 1937 flood, very little livestock was kept in these bottoms, but more cattle are being brought in by cattle feeders.

The urban section covers about 16 square miles of territory taken up by the city of Evansville and its suburbs. The soils of groups *E* and *G* (fig. 2, p. 38) are included, principally Weinbach silt loam, although McGary and Montgomery soils occur in the northern part of this section near Pigeon Creek. Some Wheeling loam and Wheeling silt loam occur in the eastern part, and the city touches the edge of the Memphis-Vanderburg soil area. Cultivation here is confined to garden plots.

The prevailing management practices have been discussed (pp. 96 to 103) in detail under the various types of farming. Most of the upland soils are not producing the maximum acre yields under the prevailing management. Corn, soybeans, wheat, and hay are usually grown in a 4-year rotation, or where hay is not needed, in a 2- or 3-year rotation. Wheat is commonly the only crop fertilized. The soils in general are strongly acid and need lime. If more lime were used, red clover could be grown and the fertility of the soil could be maintained better. More green manures as red clover and soybeans should be turned under. The response to better management is indicated by the higher yields obtained in the general farming, hog, and dairy area of the county. Here red clover is usually grown in rotation with corn and wheat. Wheat is always fertilized, except on the dark-colored soils, and corn in many places receives an application of fertilizer. Liberal supplies of manure from cattle and hogs supplement the fertilizer applications. Most of the soil in this area has been limed and is nearly neutral in reaction.

Protecting the soil from erosion by growing cover crops and using proper rotation is necessary in many sections. If fields were laid out according to land types and then cultivated on the contour, erosion losses could be more effectively controlled.

Table 8 presents some land management recommendations for soil conservation based on slope and degree of erosion. All of the soils of the county can be fitted into this table.

TABLE 8.—*Land-management recommendations for soil conservation based on slope and degree of erosion*

Slope gradient	No erosion	Eroded	Severely eroded	Rough gullied land
0-3 percent	On alluvial soils no conservation problem. On upland soils use proper crop rotations, which include cover crops.	Seed gullies to grass and do not plow over them. Use proper crop rotations, which include cover crops.	None mapped	
3-6 percent	Soils subject to fairly rapid runoff. Plow on the contour and use proper crop rotations, which include cover crops. On long slopes it may be practical to terrace the fields.	Seed gullies to grass and do not plow over them. Turn under green manures. Advisable to use a cover crop as rye between two successive cultivated crops, as between corn and soybeans. Strip cropping or terracing may be practical on long slopes.	Land too eroded for cultivation. Deep gullies should be controlled by check dams and seeded to grass or trees and protected from overgrazing. The rest of the land should be seeded to grass or permanent pasture.	
6-10 percent	Soils subject to rapid runoff and serious erosion if not protected by a cover crop. Plow on the contour. Contour furrowing, terracing, and strip cropping may be practical on long slopes. Change crop rotation to include more hay crops and less cultivated crops.	Stabilize gullies by seeding to grass and turn under green manures. Liming is beneficial for growth of alfalfa and red clover.	Land suitable for hay or pasture. Stabilize deep gullies by check dams and vegetation. Sow to lespedeza or other thick-growing grasses. Advisable to lime and use superphosphate for stands of red clover and alfalfa.	Stabilize gullies by check dams and seed to thick-growing grasses. Protect fields back of gullies by providing a proper vegetative cover to keep gullies from eating back. Plant areas to black locust trees or other fast-growing species.
10-14 percent	Runoff very rapid and the soils are subject to severe erosion if cultivated continuously Best suited for hay or pasture. Best to retain wooded areas in timber.	Stabilize shallow gullies by seeding to grass. Plow on the contour whenever necessary to renew stands of permanent grasses. Lime and superphosphate are advised for stands of red clover, alfalfa, or bluegrass.	Stabilize deep gullies by check dams and vegetation and protect from grazing. Do not graze land of this class too closely.	
14-25 percent	Best to retain wooded areas in timber. Follow recommendations for eroded land if cultivated.	Sow to permanent pasture if land is cleared rather than to cultivated crop. Lime and superphosphate may be necessary for good stands.	Control gullies by check dams and vegetation. Plant the steep narrow and gullied areas to trees.	
Over 25 percent.	Maintain in trees	Control gullies by check dams and vegetation. Plant all areas to trees and protect from grazing.		

PRODUCTIVITY RATINGS AND PHYSICAL LAND CLASSIFICATION

Table 9 presents a summary of the estimated average acre yields of the principal crops for each soil type or phase in Vanderburgh County under prevailing soil management practices.

TABLE 9.—*Estimated acre yields, under prevailing soil management practices, of the principal crops g* *Ind.*[1]

Soil (soil types, phases, and land types)	Slope range	Corn (open-pollinated)		Corn (hybrid)		Wheat		Soybeans (seed)		Lespedeza hay	Timothy and redtop hay		Red clover hay		A
		A	B	A	B	A	B	A	B	A	A	B	A	B	A
	Percent	*Bu*	*Bu.*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Ton*
Adler silt loam	0-3	40				16		20					1.6		
Alford silt loam	3-6		50				22		20			1.7		1.5	
Alford silt loam, level phase	0-3		50				22		20			1.7		1.5	
Alford silt loam, eroded phase	3-6		50				22		20			1.7		1.5	
Alford silt loam, eroded slope phase	6-10		35				18		18			1.6		1.3	
Alford silt loam, severely eroded slope phase	6-10														
Alford silt loam, severely eroded hill phase	10-14														
Algiers silt loam	0-3	50						20					2.0		
Algiers silt loam, colluvial phase	0-3	50				18		20					2.0		
Ayrshire silt loam (drained)	0-3		50		55		20		20			1.8	1.7		
Boehne silt loam	0-3	25						15							
Boehne silt loam, gentle-slope phase	3-6	25						14							
Ginat silt loam (drained)	0-3	18				10					1.0				
Hosmer silt loam	3-6	35				18		18		1.2	1.5			1.5	
Hosmer silt loam, level phase	0-3	35				19		20		1.2	1.5			1.5	
Hosmer silt loam, eroded phase	3-6	28				14		15		1.0	1.5				
Hosmer silt loam, slope phase	6-10	30				15		16		1.2	1.4				
Hosmer silt loam, eroded slope phase	6-10	25				14		15		1.0	1.4				
Hosmer silt loam, hill phase	10-14														
Hosmer silt loam, eroded hill phase	10-14														
Hosmer silt loam, severely eroded slope phase	6-10														
Hosmer silt loam, severely eroded hill phase	10-14														
Huntington fine sandy loam	0-3	40						20							3
Huntington silt loam	0-3	50		55				25							4
Huntington silt loam, gentle-slope phase	3-6	50		55				25							4.
Huntington silty clay loam	0-3	35		40				22							3.
Huntington silty clay loam, gentle-slope phase	3-6	35		40				22							3
Huntington silty clay loam, slope phase	6-10	30		35				20							3
Inglefield silt loam	0-3	35				12		18		1.1			1.5		
Iona silt loam	0-3		50				22		20			1.7		1.5	
Iona silt loam, eroded gentle-slope phase	3-6		50				22		20			1.7		1.5	
Johnsburg silt loam	0-3	35				18		20		1.3	1.5				
Johnsburg silt loam, eroded phase	0-3	33				17		20		1.3	1.5				
Keyesport silt loam	0-3	30				18		17		1.1	1.2				
Lindside silt loam	0-3	45		50				22							3

Lindside silty clay loam	0–3	32		38				20							3
Lindside silty clay loam, gentle-slope phase	3–6	32		38				20							3.
Lyles silty clay loam	0–3	30				12		20			1.5				
Markland silt loam, eroded phase	3–6	30				16		17		1.3				1.5	
Markland silt loam, slope phase	6–10	30				16		17		1.3				1.5	
Markland silt loam, eroded slope phase	6–10	25				12		14		1.0				1.5	
Markland silt loam, severely eroded phase	3–6														
Markland silt loam, steep phase	10+														
Markland silt loam, severely eroded slope phase	6–10														
Markland silt loam, eroded steep phase	10+														
Markland silt loam, severely eroded steep phase	10+														
McGary silt loam	0–3	30				18		18						1.5	
Melvin silty clay loam	0–3	20						15							
Melvin silty clay	0–3														
Memphis silt loam	3–6	30				15		18		1.4	1.6				
Memphis silt loam, level phase	0–3	30				15		18		1.5	1.6				
Memphis silt loam, colluvial phase	0–3	40				18		20		1.5	1.7		1.5		2.
Memphis silt loam, eroded phase	3–6	25				13		18		1.0	1.5				
Memphis silt loam, slope phase	6–10	28				12		14		1.3	1.5				
Memphis silt loam, eroded slope phase	6–10	25				12		14		1.0	1.5				
Memphis silt loam, severely eroded slope phase	6–10														
Memphis silt loam, hill phase	10–14														
Memphis silt loam, eroded hill phase	10–14														
Memphis silt loam, severely eroded hill phase	10–14														
Memphis silt loam, steep phase	14+														
Memphis silt loam, eroded steep phase	14+														
Memphis silt loam, severely eroded steep phase	14+														
Montgomery silty clay loam (drained)	0–3	50				19		24					1.5		
Peoga silt loam (drained)	0–3	35				18		15			1.2			1.5	
Philo silt loam	0–3	35				15		17		1.2	1.5				
Ragsdale silt loam (drained)	0–3	50				22		25					1.7		2
Rahm silty clay loam	0–3	30		35		16		18			1.5				
Riverwash															
Rough gullied land (Vanderburgh soil material)	6–30														
Sandy alluvium	0–10	15													
Sciotoville silt loam	0–3	30				14		18		1.0	1.2				
Sciotoville silt loam, gentle-slope phase	3–6	30				14		18		1.0	1.2				
Sciotoville silt loam eroded gentle-slope phase	3–6	25				11		15		1.0					
Stendal silt loam	0–3	35				12				1.1	1.2				
Tilsit silt loam	0–3	35				18		16		1.2	1.3			1.5	

[1] Estimates have been compiled from information obtained from farmers, from the county agent and assistants, and from in column A are obtained under a system of management that includes little or no application of lime and in which wheat is the common rotations are corn, wheat, and hay; corn, soybeans, wheat, and hay; or corn and soybeans. Red clover and alfalfa are neutral in reaction. Yields in column B are obtained under a level of management that includes liming and the common fertili and alfalfa are important crops, and clover is frequently used as a green manure. The common rotation is corn, wheat, and clo

TABLE 9.—*Estimated acre yields, under prevailing soil management practices, of the principal crops g*
Ind.—Continued

Soil (soil types, phases, and land types)	Slope range	Corn (open-polli-nated) A	Corn (open-polli-nated) B	Corn (hybrid) A	Corn (hybrid) B	Wheat A	Wheat B	Soy-beans (seed) A	Soy-beans (seed) B	Les-pe-deza hay A	Timothy and red-top hay A	Timothy and red-top hay B	Red clover hay A	Red clover hay B	A
	Percent	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu*	*Bu.*	*Bu.*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tor*
Tilsit silt loam, eroded gentle-slope phase	3-6	30				16		15		1 0	1.2				
Vanderburgh silt loam	14-25														
Vanderburgh silt loam, eroded phase	14-25														
Vanderburgh silt loam, hill phase	10-14														
Vanderburgh silt loam, eroded hill phase	10-14														
Vanderburgh silt loam, severely eroded phase.	14-25														
Vanderburgh silt loam, severely eroded hill phase.	10-14														
Vanderburgh silt loam, very steep phase	25+														
Vanderburgh silt loam, eroded very steep phase	25+														
Vanderburg silt loam, severely eroded very steep phase	25+														
Waverly silt loam (drained)	0-3	20						12			1.0				
Weinbach silt loam (drained)	0-3	25				12		18		1 0	1 2				
Wheeling fine sandy loam	0-3	25				10				1.0			1.5		2.0
Wheeling fine sandy loam, eroded gentle-slope phase	3-6	25				10				1.0					
Wheeling fine sandy loam, eroded slope phase	6-10														
Wheeling loam	0-3	30				12		18		1.2	1 5			1 5	
Wheeling loam, eroded gentle-slope phase	3-6	25				10		16			1 5			1 5	
Wheeling silt loam	0-3	35				16		18		1 2	1 5			1 5	
Wheeling silt loam, eroded gentle-slope phase	3-6	35				16		18		1.2	1.5				
Wheeling silt loam, severely eroded gentle-slope phase	3-6														
Wheeling silt loam, eroded slope phase	6-10	25				12		14		1.2	1.3				
Wheeling silt loam, severely eroded slope phase	6-10														
Wheeling silt loam, eroded steep phase	10+														
Wheeling silt loam, severely eroded steep phase	10+														
Woodmere silty clay loam	0-3	35		40		18		20			2.0		1.5		2.7
Woodmere silty clay loam, eroded phase	0-3	30		35		16		20			2.0		1.4		2.5
Woodmere silty clay loam, gentle-slope phase	3-6	30		35		16		20			2.0		1.4		2.5
Woodmere silty clay loam, eroded gentle-slope phase	3-6	28				12		15		1.2	1.5				

Woodmere silty clay loam, severely eroded gentle-slope phase	6–12														
Zanesville silt loam	3–6	35				18		18		1.2	1.5			1.5	
Zanesville silt loam, level phase	0–3	35				19		20		1.2	1.5			1.5	
Zanesville silt loam, eroded phase	3–6														
Zanesville silt loam, slope phase	6–10	25				12		15		1.2	1.3				
Zanesville silt loam, eroded slope phase	6–10	20				12		15		0.8	1.0				
Zanesville silt loam, severely eroded slope phase	6–10														
Zipp silt loam (drained)	0–3	50				20		20					1.5		2.2
Zipp silty clay loam (drained)	0–3	50				18		24					1.5		

These estimated average acre yields are based on information obtained from the farmers, from the county agent or his assistants, and from observations by the members of the soil survey field party. Because no written records are available and because even farmers' statements concerning yields cannot be obtained for every soil type and phase, average yields are estimated partly on the basis of yield information and partly on the basis of internal and external soil characteristics. The average yields reported are those obtained by the average to better-than-average farmers, using a regular 3- or 4-year rotation.

As two different types of management practice are common within the county, the yields are listed under two columns, headed "A" and "B," in order to make the figures comparable for any soil and to show that the higher yields of one soil over another can be attributed in a large measure to better management practices rather than to desirable soil characteristics.

The "A" type is predominant within the county. Under this system little or no lime is applied to the soils; consequently, clover and alfalfa are not grown, except where the soil is naturally sweet or neutral in reaction. The common rotations are corn, wheat, and hay; corn, soybeans, wheat, and hay; or corn and soybeans. Hay is principally lespedeza, or timothy and redtop, and to a lesser extent timothy and clover. Wheat is generally the only crop fertilized.

Under the "B" type the soils have been recently limed and are neutral or sweet in reaction. Red clover and alfalfa are grown extensively. The common rotations are corn, wheat, and clover. Wheatland is always fertilized or manured and cornland is frequently fertilized. Clover is frequently turned under as a green manure. This system exists chiefly in the northwestern part of the county, where hog-raising and dairying are important and where a self-sustaining type of agriculture is carried on. Yields of clover and alfalfa grown on soils that are not naturally sweet are reported in the "B" column, because the application of lime is necessary. Potato yields are all listed in the "B" column as only one type of management is common. They are raised in small plots and receive heavy applications of manure and fertilizer. It is recognized that not every acre of each soil type or phase will produce these average yields, owing to variations in fertility of individual fields and differences in management practices of individual farmers. A lower level of management exists than that of the "A" type, and likewise a "B" type of management exists for soils reported only under the "A" type. If records were available for these three levels of management for each soil, an accurate appraisal of the range in productivity of any type or phase could be compiled.

The right-hand column gives the principal crops grown or the use of the land for each soil. This information is a result of field observations and personal impressions and is not a result of detailed statistical study.

In order to compare directly the yields obtained in Vanderburg County with those obtained in other parts of the country, yield figures have been converted to indexes based on standard yields of reference in table 10. The soils are listed in the approximate order of their general productivity under the common practices that are represented by the two systems of management—"A" and "B."

The rating compares the productivity of each of the soils for each crop to a standard—100. This standard index represents the approximate average acre yield obtained without the use of amendments on the more extensive and better soil types of the regions of the United States in which the crop is most widely grown. An index of 50 indicates that the soil is about half as productive for the specified crop as is the soil with the standard index. The standard yield for each crop shown in table 10 is given at the head of each respective column. Soils given amendments, such as lime and commercial fertilizers, or special practices, such as irrigation, and unusually productive soils of small extent, may have productivity indexes of more than 100 for some crops.

The principal factors affecting the productivity of land are climate, soil (this includes the many physical, chemical, and biological characteristics), slope, drainage, and management, including the use of amendments. No one of these factors operates separately from the others, although some one may dominate. In fact, the factors listed may be grouped simply as the soil factor and the management factor. Slope, drainage, and most of the aspects of climate may be considered as characteristics of a given soil type, since the soil type, as such, occupies specific geographical areas characterized by a given range of slope and climatic conditions. Crop yields over a long period of years furnish the best available summation of the associated factors and, therefore, are used where available.

The order in which the soils are listed is based on the following weighted average of the crop indexes: Corn, 30; wheat, 25; soybeans, 15; lespedeza, 2; timothy and redtop, 5; red clover, 5; alfalfa, 2; potatoes, 1; and pasture, 15. Since it is difficult to measure mathematically either the exact significance of a crop in the agriculture of an area or the importance or suitability of certain soils for particular crops, it is realized that this order may not be entirely satisfactory. For those soils, such as the Huntington and Lindside, on which corn and soybeans are the principal crops and on which wheat is not commonly grown, the weighted average was changed as follows: Corn, 50; wheat, 5; soybeans, 20; lespedeza, 1; timothy and redtop, 1; red clover, 3; alfalfa, 5; and pasture, 15.

Productivity tables do not present the relative roles that soil types, because of their extent and the pattern of their distribution, play in the agriculture of the county. The tables show the relative productivity of individual soils. They cannot picture in a given county the total quantitative production of crops by soil areas without the additional knowledge of the acreage of the individual soil types devoted to each of the specified crops.

Economic considerations play no part in determining the crop productivity indexes. They cannot be interpreted, therefore, into land values, except in a very general way. Distance to market, relative prices of farm products, and other factors influence the value of land. It is important to realize that productivity, as measured by yields, is not the only consideration that determines the relative worth of a soil for growing crops. The ease or difficulty of tilling the soil or maintaining its productivity are examples of considerations other than productivity that influence the general desirability of a soil for agricultural use. In turn, steepness of slope, presence or

TABLE 10.—*Productivity ratings of the soils of Vanderburgh Count*

Soil (soil types, phases, and land types) [1]	Crop productivity index [2] for— Corn (100=50 bu.) (Open polli-nated)		Corn (Hy-brid)		Wheat (100=25 bu.)		Soy-beans (100=25 bu.)		Soy-bean hay (100=2.5 tons)	Les-pedeza hay (100=1.5 tons)	Timo-thy and redtop hay (100=2 tons)		Re clov ha (100 ton
	A	B	A	B	A	B	A	B	A	A	A	B	A
Huntington silt loam	100		110				100						
Huntington silt loam, gentle-slope phase	100		110				100						
Ragsdale silt loam (drained)	100				88		100						85
Montgomery silty clay loam (drained)	100				75		95						75
Alford silt loam, level phase [3]		100				88		80				85	
Alford silt loam		100				88		80				85	
Alford silt loam, eroded phase		100				88		80				85	
Iona silt loam		100				88		80				85	
Algiers silt loam, colluvial phase	100				72		80						100
Iona silt loam, eroded gentle-slope phase		100				88		80				85	
Zipp silt loam (drained)	100				80		80						75
Zipp silty clay loam (drained)	100				72		95						75
Ayrshire silt loam (drained)		100		110		80		80				90	85
Lindside silt loam	90		100				88						
Algiers silt loam	100						80						100
Huntington fine sandy loam	80						80						
Memphis silt loam, colluvial phase	80				72		80			100	85		75
Adler silt loam	80				64		80						80
Huntington silty clay loam	70		80				88						
Huntington silty clay loam, gentle-slope phase	70		80				88						
Woodmere silty clay loam	70		80		72		80				100		
Zanesville silt loam, level phase	70				76		80			83	75		
Hosmer silt loam, level phase	70				76		80			80	75		
Zanesville silt loam	70				72		72			83	75		
Hosmer silt loam	70				72		72			80	75		
Lindside silty clay loam	64		76				80						
Lindside silty clay loam, gentle-slope phase	64		76				80						
Woodmere silty clay loam, gentle-slope phase	60		70		64		80				100		
Johnsburg silt loam	70				72		80			87	75		
Alford silt loam, eroded slope phase		70				72		72				80	
Wheeling silt loam	70				64		72			80	75		
Woodmere silty clay loam, eroded phase	60		70		64		80				100		70
Keyesport silt loam	60				72		68			73	60		

Philo silt loam	70	----	----	----	60	----	68	----	60	80	75	----	----
Rahm silty clay loam	60	----	70	----	64	----	72	----	----	----	75	----	----
Tilsit silt loam	70	----	----	----	72	----	64	----	----	80	65	----	----
Johnsburg silt loam, eroded phase	66	----	----	----	68	----	80	----	----	87	75	----	----
Markland silt loam, slope phase	60	----	----	----	64	----	68	----	----	87	----	----	----
Markland silt loam, eroded phase	60	----	----	----	64	----	68	----	----	87	----	----	----
Memphis silt loam, level phase	60	----	----	----	60	----	72	----	----	100	80	----	----
Memphis silt loam	60	----	----	----	60	----	72	----	----	93	80	----	----
Inglefield silt loam	70	----	----	----	48	----	72	----	----	73	----	----	75
Huntington silty clay loam, slope phase	60	----	70	----	----	----	80	----	----	----	----	----	----
Wheeling silt loam, eroded gentle-slope phase	70	----	----	----	64	----	72	----	----	80	75	----	----
Wheeling loam	60	----	----	----	48	----	72	----	----	80	75	----	----
Peoga silt loam (drained)	70	----	----	----	72	----	60	----	----	----	60	----	----
McGary silt loam	60	----	----	----	72	----	72	----	----	----	----	----	----
Sciotoville silt loam	60	----	----	----	56	----	72	----	----	67	60	----	----
Sciotoville silt loam, gentle-slope phase	60	----	----	----	56	----	72	----	----	67	60	----	----
Hosmer silt loam, slope phase	60	----	----	----	60	----	64	----	----	80	70	----	----
Lyles silty clay loam	60	----	----	----	48	----	80	----	----	----	75	----	----
Stendal silt loam	70	----	----	----	48	----	----	----	60	73	60	----	----
Woodmere silty clay loam, eroded gentle-slope phase	56	----	----	----	48	----	60	----	----	80	75	----	----
Tilsit silt loam, eroded gentle-slope phase	60	----	----	----	64	----	60	----	----	67	60	----	----
Wheeling loam, eroded gentle-slope phase	50	----	----	----	40	----	64	----	----	80	75	----	----
Hosmer silt loam, eroded phase	56	----	----	----	56	----	60	----	----	67	75	----	----
Memphis silt loam, eroded phase	50	----	----	----	52	----	72	----	----	67	75	----	----
Memphis silt loam, slope phase	56	----	----	----	48	----	56	----	----	87	75	----	----
Hosmer silt loam, eroded slope phase	50	----	----	----	56	----	60	----	----	67	70	----	----
Weinbach silt loam (drained)	50	----	----	----	48	----	72	----	----	67	60	----	----
Boehne silt loam	50	----	----	----	----	----	60	----	----	----	----	----	----
Boehne silt loam, gentle-slope phase	50	----	----	----	----	----	56	----	----	----	----	----	----
Markland silt loam, eroded slope phase	50	----	----	----	48	----	56	----	----	67	----	----	----
Memphis silt loam, eroded slope phase	50	----	----	----	48	----	56	----	----	67	75	----	----
Zanesville silt loam, slope phase	50	----	----	----	48	----	60	----	----	80	65	----	----
Wheeling silt loam, eroded slope phase	50	----	----	----	48	----	56	----	----	80	65	----	----
Sciotoville silt loam, eroded gentle-slope phase	50	----	----	----	44	----	60	----	----	67	----	----	----
Wheeling fine sandy loam	50	----	----	----	40	----	----	----	----	67	----	----	75
Wheeling fine sandy loam, eroded gentle-slope phase	50	----	----	----	40	----	----	----	----	67	----	----	----
Zanesville silt loam, eroded slope phase	40	----	----	----	48	----	60	----	----	53	50	----	----
Melvin silty clay loam	40	----	----	----	----	----	60	----	----	----	----	----	----
Waverly silt loam (drained)	40	----	----	----	----	----	48	----	50	----	50	----	----
Ginat silt loam (drained)	36	----	----	----	----	----	40	----	----	----	50	----	----
Sandy alluvium	30	----	----	----	----	----	----	----	----	----	----	----	----

See footnotes at end of table.

TABLE 10.—*Productivity ratings of the soils of Vanderburgh County, Ind.*

Soil (soil types, phases, and land types)	Crop productivity index for—													
	Corn (100=50 bu.)				Wheat (100=25 bu.)		Soy-beans (100=25 bu.)		Soy-bean hay (100=2.5 tons)	Les-pedeza hay (100=1.5 tons)	Timo-thy and redtop hay (100=2 tons)		Re clov ha (100 ton	
	(Open polli-nated)		(Hy-brid)											
	A	B	A	B	A	B	A	B	A	A	A	B	A	
Alford silt loam, severely eroded phase														
Alford silt loam, severely eroded hill phase														
Wheeling silt loam, severely eroded gentle-slope phase														
Zanesville silt loam, eroded phase														
Markland silt loam, severely eroded phase														
Wheeling silt loam, severely eroded slope phase														
Memphis silt loam, severely eroded slope phase														
Hosmer silt loam, hill phase														
Hosmer silt loam, eroded hill phase														
Memphis silt loam, hill phase														
Memphis silt loam, eroded hill phase														
Vanderburgh silt loam, hill phase														
Markland silt loam, steep phase														
Hosmer silt loam, severely eroded slope phase														
Wheeling fine sandy loam, eroded slope phase														
Markland silt loam, severely eroded slope phase														
Zanesville silt loam, severely eroded slope phase														
Memphis silt loam, severely eroded hill phase														
Hosmer silt loam, severely eroded hill phase														
Vanderburgh silt loam, eroded hill phase														
Vanderburgh silt loam														
Vanderburgh silt loam, eroded phase														

Markland silt loam, eroded steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Memphis silt loam, steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Wheeling silt loam, eroded steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Memphis silt loam, eroded steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Markland silt loam, severely eroded steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Memphis silt loam, severely eroded steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Wheeling silt loam, severely eroded steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanderburgh silt loam, severely eroded hill phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanderburgh silt loam, severely eroded phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanderburgh silt loam, very steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanderburgh silt loam, eroded very steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanderburgh silt loam, severely eroded very steep phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Woodmere silty clay loam, severely eroded gentle-slope phase	--	--	--	--	--	--	--	--	--	--	--	--	--
Melvin silty clay	--	--	--	--	--	--	--	--	--	--	--	--	--
Rough gullied land (Vanderburgh soil material)	--	--	--	--	--	--	--	--	--	--	--	--	--
Riverwash	--	--	--	--	--	--	--	--	--	--	--	--	--
Made land	--	--	--	--	--	--	--	--	--	--	--	--	--
Borrow pits	--	--	--	--	--	--	--	--	--	--	--	--	--

[1] The soils are listed in the approximate order of their general productivity under the prevailing practices of soil manageme

[2] The soils are given indexes that indicate the approximate average production of each crop in percent of the standard of average yield obtained without the use of amendments on the more extensive and better soil types of those regions of the U The indexes are based on estimates of yields (see table 9), as yield data are yet too fragmental to be adequate. Indexes in co management that includes little or no application of lime and in which wheat is the only crop for which fertilizer is commonl hay, corn, soybeans, wheat, and hay; or corn and soybeans. Red clover and alfalfa are not grown, except where the soil is natur "B" refer to yields obtained under a system of management that includes liming and the common fertilization of cornland as well crops, and clover is frequently used as a green manure. The common rotation is corn, wheat, and clover Absence of an inde

[3] Ratings of the Alford soils are based on their production under improved practices indicated in column B. These practi in their being given a higher general rating than has been reported for some other areas.

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absence of stone, the resistance to tillage offered by the soil because of its consistence or structure, and the size and shape of areas influence the relative ease of tilling the soil. Likewise, inherent fertility and susceptibility to erosion influence the ease of maintaining its productivity at a given level. Productivity, as measured by yields, is influenced to some degree by all of these and other factors, such as moisture-holding capacity and permeability to roots and water, and so they are not factors to be considered entirely separately from productivity. On the other hand, schemes of land classification to designate the relative suitability of land for agricultural use must give some separate recognition to them.

In table 11 the soils of Vanderburgh County are arranged in five major groups or soil classes on the basis of their physical suitability for growing crops, pasture, or forest, as determined by their productivity, workability, and erodibility.

In the group of First-class soils (excellent to good cropland) are those soils that produce high yields of the major crops, are high in fertility, are easy to work, and present few problems of conservation. Simple erosion-control practices, such as contour tillage, strip cropping, and terracing, are necessary only on Alford silt loam, Alford silt loam, eroded phase, and Iona silt loam, eroded gentle-slope phase. However, most of these soils are being well managed at present. Many of the soils in this group are tile-drained and ditched because of the presence of a high water table.

The Second-class soils, which are considered good to fair cropland, produce smaller yields of corn than those of the First-class, but the yields of other crops are fairly high. The soils are slightly lower in fertility and generally are harder to work, owing to the lay of the land or slightly eroded condition. Except in a few cases the majority of the slopes do not exceed 6 percent. In this group simple erosion-control practices are recommended for the sloping soils in order to reduce runoff and erosion under continuous cultivation. These simple practices include contour tillage, strip cropping, and terracing. Which one or combination of these practices should be used depends largely on the length of the slopes. Most of the slopes are probably too short to warrant strip cropping or terracing, but cultivating on the contour is practiced. Proper crop rotation and use of cover crops, green manures, lime, and fertilizer are practices that can be used by all the farmers for the maintenance of productivity and the control of erosion. In addition, some of the soils included in this group are tile-drained. Drainage of poorly drained soils is necessary in order to obtain the average yields presented in table 9. The Huntington and Lindside soils are subject to overflow during the winter and early spring, but such overflow ordinarily does not harm or interfere with the production of corn and soybeans, the principal crops on these soils.

The Third-class soils comprise the fair to poor cropland. They produce lower yields of the crops grown than either of the previous two groups, owing largely to lower fertility and poorer moisture conditions. These soils likewise possess, to varying degrees, one or more of the following undesirable land characteristics: Erosion, either sheet or gully; relatively steep slopes; poor natural drainage; excessive

underdrainage; or excess sand on the surface. The eroded soils as well as those occupying slopes greater than 6 percent are not adapted to corn. Corn tends to fire early in the season because of a lack of sufficient moisture and plant nutrients. Intensive erosion-control practices are necessary in order to cultivate these soils continuously to crops of corn, wheat, and soybeans if good yields are to be maintained. These erosion-control practices include contour tillage, strip cropping, and terracing. Which of these practices or combination of practices should be used depends on the slope, size, and eroded condition of the fields, as well as on economic and practical considerations. Rotations on the steeper and eroded soils in this group should be changed to include a hay or cover crop for a longer period of time and less corn. Green manures should be turned under frequently in order to increase the fertility, tilth, and water-holding capacity of the soil. If lime and fertilizer or manure were used, crop yields could be greatly increased and more vigorous vegetative stands could be obtained.

The soils in the Fourth class constitute the poor cropland. They are generally steeper and more eroded than those of the previous group and are not adapted for continuous cultivation, but are best suited for permanent pasture. Occasional contour cultivation may be permitted in order to renew the stands of permanent pasture plants and reduce the growth of weeds. Many of these soils occur on short steep slopes of small acreage and are farmed in conjunction with the smoother soils. Wheat is a frequent crop. It may not be practicable to take such areas out of cultivation, but certainly some steps should be taken in order to reduce additional soil losses. On some of the less steep areas, terracing may be practicable and profitable. In this county most of the pastures are rotation pastures. The small number of cattle within the county has not made it necessary to improve low-grade cropland and convert it into permanent pastures. With the introduction of sheep and more cattle and the adoption of a sound pasture program, however, large areas of poor idle land could be converted into productive permanent pastures. On the eroded areas lespedeza can be sown in order to protect the soil. Such areas, if they are to be pastured, should be heavily manured or fertilized. The State Experiment Station recommends (*12*) 400 pounds 4–10–6 fertilizer for new seedlings, and 400 pounds superphosphate for a top dressing or renovating old pastures with deep-rooted legumes. Where the soils have been limed and fertilized, good stands of red clover and alfalfa have been obtained. Gullies, both shallow and deep, should be stabilized by check dams and by planting to thick- and fast-growing varieties of plants or grasses.

The soils in the Fifth class are not adapted to crops but are better suited for permanent pasture or forestry. They are too steep, eroded, or they occur in too small or narrow areas to cultivate. Most of the eroded areas are idle or grown up in brush and weeds. If a great need for pastures existed, some of the areas could be reclaimed for permanent pasture, otherwise forestry would be the best use.

TABLE 11.—*Grouping of soils and remarks as to workability, erodibility, and management of t*

Soil (soil types, phases, and land types)	Workability (relative ease with which soil areas can be worked with common farm machinery)	Erodibility, if tilled	Some of the important manageme practices for the maintenance a increase of productivity
Huntington silt loam	Good	Very low, if any	Rotation of corn and soybeans
Huntington silt loam, gentle-slope phase.	do	Very low	do
Ragsdale silt loam (drained)	Medium—occasional overflow.	Very low, if any	Drainage by tile or open ditches
Montgomery silty clay loam (drained)	Poor—heavy soil	do	do
Alford silt loam, level phase	Good	Low	Legumes in rotations and cover crop
Alford silt loam	do	do	Contour tillage and cover crops
Alford silt loam, eroded phase	do	Medium	Contour tillage, cover crops, and gre manures.
Iona silt loam	do	Low	Legumes in rotations and cover cro
Algiers silt loam, colluvial phase	do	Very low	Legumes in rotations
Iona silt loam, eroded gentle-slope phase.	do	Medium	Legumes in rotations, cover crop and contour tillage.
Zipp silt loam (drained)	Medium—occasional overflow.	Very low, if any	Drainage by tile or open ditches
Zipp silty clay loam (drained)	Poor—heavy soil and overflow infrequent	do	do
Ayrshire silt loam (drained)	Good	Low	do
Lindside silt loam	Medium—slow runoff of floodwaters.	Very low, if any	Rotation of corn and soybeans
Algiers silt loam	Good—subject to some overflow.	do	Legumes in rotations
Huntington fine sandy loam	do	do	do
Memphis silt loam, colluvial phase	Good	Very low	do
Adler silt loam	Good—subject to some overflow.	Very low, if any	do
Huntington silty clay loam	Medium—heavy soil	do	Legumes in rotations. Turn und soybeans to increase organic matt and improve tilth.
Huntington silty clay loam, gentle-slope phase.	do	Low	do
Woodmere silty clay loam	do	do	Legumes in rotations
Zanesville silt loam, level phase	Good	do	Liming and legumes in rotations
Hosmer silt loam, level phase	do	do	do
Zanesville silt loam	do	Medium	do
Hosmer silt loam	do	do	do
Lindside silty clay loam	Medium—slow runoff of floodwaters.	Very low, if any	Legumes in rotations. Turn und soybeans to increase organic matt and improve tilth.
Lindside silty clay loam, gentle-slope phase.	do	Low	do

Woodmere silty clay loam, gentle-slope phase.	Medium—heavy soil	Medium	Legumes in rotations
Johnsburg silt loam	Good	Low	Liming and legumes in rotations
Alford silt loam, eroded slope phase	Medium	High	Contour tillage, cover crops, legumes
Wheeling silt loam	Good	Low	Lime, legumes, and cover crops
Woodmere silty clay loam, eroded phase.	Medium	do	Legumes in rotations, cover crops
Keysport silt loam	Good	do	Drainage and proper rotations
Philo silt loam	do	Very low, if any	do
Rahm silty clay loam	Medium	do	do
Tilsit silt loam	Good	Low	Lime and legumes
Johnsburg silt loam, eroded phase	do	Medium	Lime, legumes, contour tillage
Markland silt loam, slope phase	Medium	do	Contour tillage, cover crops
Markland silt loam, eroded phase	do	do	do
Memphis silt loam, level phase	Good	Low	Lime, green manures, legumes
Memphis silt loam	Medium	Medium	Lime, green manures, legumes, a[illegible] contour tillage.
Inglefield silt loam	Good—subject to some overflow.	Very low, if any	Drainage and legumes in rotation
Huntington silty clay loam, slope phase.	Medium	Medium	Contour tillage
Wheeling silt loam, eroded gentle-slope phase.	do	do	Lime, cover crops, legumes, and co[illegible] tour tillage.
Wheeling loam	Good	Low	Lime, green manures, legumes
Peoga silt loam (drained)	Good (if drained)	Very low, if any	Drainage, lime, and legumes
McGary silt loam	do	Low	do
Sciotoville silt loam	Medium	do	Lime, green manures
Sciotoville silt loam, gentle-slope phase	do	Medium	Lime, green manures, cover crops, a[illegible] contour tillage
Hosmer silt loam, slope phase	Poor	High	Contour tillage and cover crops
Lyles silty clay loam	Very poor	Very low, if any	Drainage and green manures
Stendal silt loam	Good—subject to some overflow.	do	Legumes in the rotations
Woodmere silty clay loam, eroded gentle-slope phase.	Medium	Medium	Cover crops and contour tillage
Tilsit silt loam, eroded gentle-slope phase.	Good	do	Lime, cover crops, and contour tillag[illegible]
Wheeling loam, eroded gentle-slope phase.	do	do	do

TABLE 11.—*Grouping of soils and remarks as to workability, erodibility, and management of the so*

Soil (soil types, phases, and land types)	Workability (relative ease with which soil areas can be worked with common farm machinery)	Erodibility, if tilled	Some of the important manageme practices for the maintenance a increase of productivity
Hosmer silt loam, eroded phase	Medium	Medium	Lime, cover crops, green manures, a contour tillage.
Memphis silt loam, eroded phase	Poor	do	do
Memphis silt loam, slope phase	do	High	do
Hosmer silt loam, eroded slope phase	do	do	Lime, cover crops, green manures, co tour tillage, and terraces where pra tical
Weinbach silt loam (drained)	Good (if drained)	Low	Drainage, lime, and green manures.
Boehne silt loam	Good	Very low, if any	Legumes and green manures
Boehne silt loam, gentle-slope phase	Medium	Medium	do
Markland silt loam, eroded slope phase	Poor	High	Green manures, cover crops, long rot tions, and contour tillage.
Memphis silt loam, eroded slope phase	do	do	Lime, green manures, cover crops, a contour tillage.
Zanesville silt loam, slope phase	Medium	do	do
Wheeling silt loam, eroded slope phase	Poor	do	Lime, green manures, cover crops, lo rotations, and contour tillage.
Sciotoville silt loam, eroded gentle-slope phase.	Medium	Medium	Lime, green manures, cover crop and contour tillage.
Wheeling fine sandy loam	Good	Low	Cover crops and legumes in the rot tions.
Wheeling fine sandy loam, eroded gentle-slope phase.	do	Medium	do
Zanesville silt loam, eroded slope phase	Poor	High	Lime, green manures, cover crops, co tour tillage, and contour furrows.
Melvin silty clay loam	Poor—slow runoff of flood-waters.	Very low, if any	Open ditches for drainage. Rotatio of corn and soybeans.
Waverly silt loam (drained)	do	do	Drainage, lime, and green manures.
Ginat silt loam (drained)	do	do	do
Sandy alluvium	Poor—sandy	do	Removal of excess sand

Alford silt loam, severely eroded phase	Poor	High	Sow to lespedeza or other thick-gro ing pasture plants Stabilize gull and waterways by this metho Deep gullies should be controlled check dams. Occasional conto tillage may be practicable on the l eroded areas in order to renew stan of pasture plants. Fertilizer, m nure, and lime should be used to crease the quality and density cover. After such treatment a under favorable growing conditio alfalfa, red clover, or sweetclov may be propagated.
Alford silt loam, severely eroded hill phase.	Very poor	Very high	
Wheeling silt loam, severely eroded gentle-slope phase.	Poor	Medium	
Zanesville silt loam, eroded phase	do	do	
Markland silt loam, severely eroded phase.	do	do	
Wheeling silt loam, severely eroded slope phase.	do	High	
Memphis silt loam, severely eroded slope phase.	do	do	
Hosmer silt loam, hill phase	do	Very high	
Hosmer silt loam, eroded hill phase	do	do	
Zanesville silt loam, hill phase	do	do	
Memphis silt loam, hill phase	do	do	
Memphis silt loam, eroded hill phase	do	do	
Vanderburgh silt loam, hill phase	do	do	
Markland silt loam, steep phase	Very poor—steep, short slopes.	do	
Hosmer silt loam, severely eroded slope phase.	Poor	do	
Wheeling fine sandy loam, eroded slope phase.	do	High	
Markland silt loam, severely eroded slope phase.	Very poor	do	
Zanesville silt loam, severely eroded slope phase.	do	do	
Zanesville silt loam, eroded hill phase	do	Very high	
Memphis silt loam, severely eroded hill phase.	do	do	
Hosmer silt loam, severely eroded hill phase.	do	do	
Zanesville silt loam, severely eroded hill phase.	do	do	
Vanderburgh silt loam, eroded hill phase.	do	do	
Vanderburgh silt loam	do	do	
Vanderburgh silt loam, eroded phase	do	do	

TABLE 11.—*Grouping of soils and remarks as to workability, erodibility, and management of the s*

Soil (soil types, phases, and land types)	Workability (relative ease with which soil areas can be worked with common farm machinery)	Erodibility, if tilled	Some of the important manageme practices for the maintenance a increase of productivity
Markland silt loam, eroded steep phase	Very poor	Very high	Plant to trees wherever possible St bilize deep gullies by check dar and sow some fast-growing grass to protect surface of other erod areas.
Memphis silt loam, steep phase	do	do	
Wheeling silt loam, eroded steep phase	do	do	
Memphis silt loam, eroded steep phase	do	do	
Markland silt loam, severely eroded steep phase.	do	do	
Memphis silt loam, severely eroded steep phase.	do	do	
Wheeling silt loam, severely eroded steep phase.	do	do	
Vanderburgh silt loam, severely eroded hill phase	do	do	
Vanderburgh silt loam, severely eroded phase	do	do	
Vanderburgh silt loam, very steep phase.	do	do	
Vanderburgh silt loam, eroded very steep phase	do	do	
Vanderburgh silt loam, severely eroded very steep phase.	do	do	
Woodmere silty clay loam, severely eroded gentle-slope phase	Very poor (due to eroded condition)	do	
Melvin silty clay	Very poor—too wet	Very low, if any	
Rough gullied land (Vanderburgh soil material).	Very poor	Very high	
Riverwash			
Made land			
Borrow pits			

Figure 4 is a small-scale generalized physical land classification map for the county.

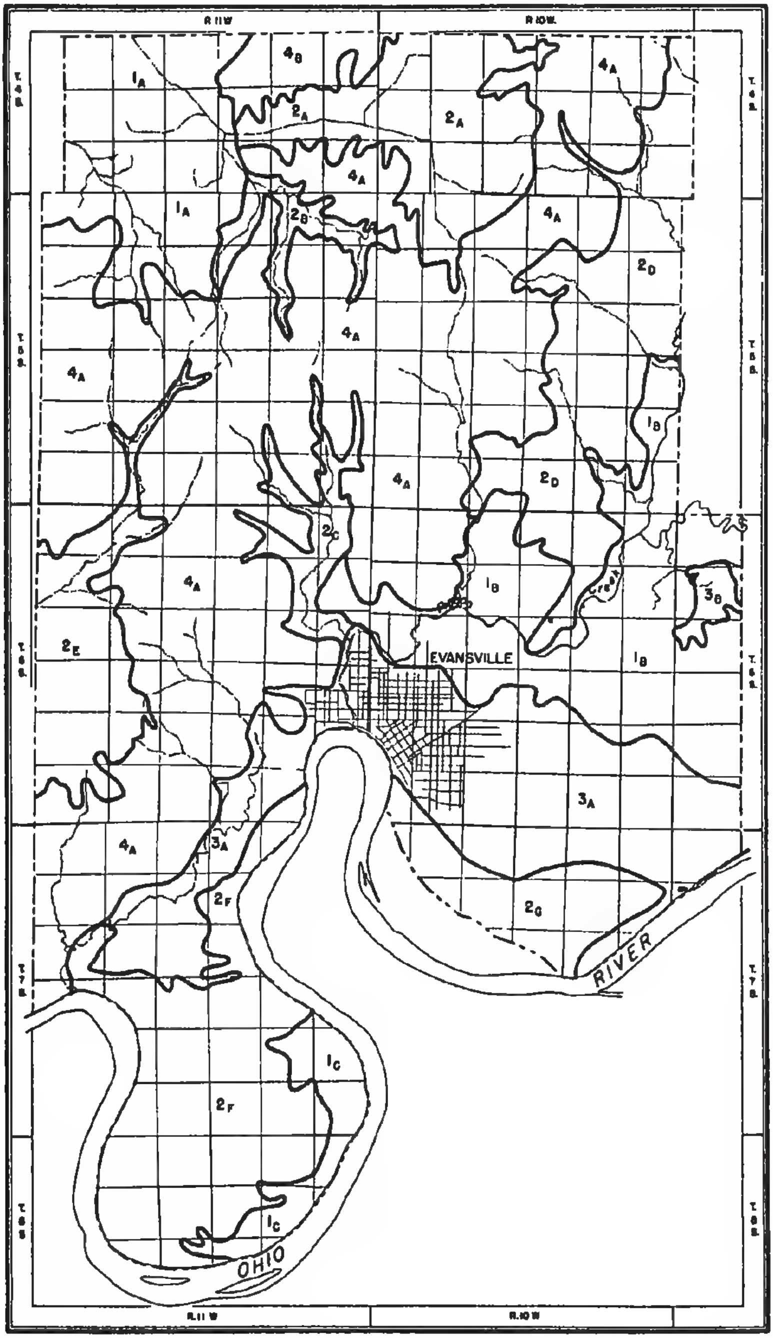

FIGURE 4—Generalized physical land classification map of Vanderburgh County, Ind.

In figure 4 geographical areas are shown each of which is dominated by the soils of a certain use-suitability class. A soil map of this general character is made by generalization of both soil characteristics and geographical areas. Just as soils of different character are grouped together to form a class, the areas on the generalized map are outlined on the basis of the geographical extent or dominance of a particular soil class in the area in question. Such a map is valuable in that it shows the broad relationships between the landscape, the soils, and the agriculture of the county. These relationships are more easily grasped than from the detailed soil map. It is useful in locating large bodies of certain types of land that may have certain problems or special use or crop adaptations.

The various geographical areas and the distribution of the various classes of soils in each area are discussed in the following pages.

The First-class soils predominate in areas 1_A, 1_B, and 1_C. The estimated[10] percentages of each class included in these areas are shown in table 12.

TABLE 12.—*Estimated percentage distribution of the several classes of soils in the various geographical areas*

Area	Soil class: First class	Second class	Third class	Fourth class	Fifth class
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
1_A	80	14	5	1	0
1_B	70	25	5	0	0
1_C	90	10	0	0	0
2_A	5	90	3	2	0
2_B	0	100	0	0	0
2_C	0	100	0	0	0
2_D	0	85	10	3	2
2_E	0	60	25	[1]	[1]
2_F, 2_G	0	90	10	0	0
3_A	0	33	65	2	0
3_B	0	20	75	[2]	[2]
4_A	0	10	20	60	10
4_B	0	[3]	[3]	.90	5

[1] Fourth and Fifth class combined represent 15 percent.
[2] Fourth and Fifth class combined represent 5 percent.
[3] Second and Third class combined represent 5 percent.

Area 1_A, a prosperous general farming section, consists chiefly of soils of the Alford, Ayrshire, and Ragsdale series together with a smaller total acreage of the Zipp, Iona, and alluvial soils. Rolling to hilly uplands together with extensive flats make up area 1_A. This is in contrast to areas 1_B and 1_C, which are nearly flat or gently undulating except near the streams where the land becomes sloping to hilly. Area 1_B, a cash-grain farming section, consists chiefly of Montgomery, Zipp, McGary, Ragsdale, and Markland soils. Figure 6 is taken from a section of area 1_B and shows the characteristic generalized pattern of soil classes. This simple pattern is in marked contrast to the complex one of area 4_A presented in figure 5. Area 1_C, which is also in the cash-grain farming section, comprises chiefly

[10] The estimates are based on visual inspection of the detailed soil map. No planimeter measurements were used. These percentages are only roughly approximate.

Huntington and Lindside silt loams. These soils produce the highest yields of corn in the county.

The Second-class soils include a large proportion of the soils of Vanderburgh County and are found in various localities (see table 12). These soils possess a favorable topography or lay of the land and are adapted to continuous cultivation. Areas 2_A, 2_B, and 2_C are part of a general farming and dairying section and consist of level to undulating areas of alluvial soils and soils of the lake plains. Peoga silt loam is dominant in area 2_A. These soils are used to raise the necessary grain and hay crops for the dairy cattle.

Area 2_D, a general farming and dairying section, has a higher percentage of Second-class land than area 2_E, which is chiefly a general farming section. In the former area a larger percentage of the land lies more favorably than in the latter area owing to the greater proportion of Tilsit, Johnsburg, and alluvial soils. These soils are used to raise most of the feed crops needed for dairy cattle. The Hosmer, Zanesville, and Vanderburgh soils are also included in these areas, but the slope, hill, and steep phases form a larger proportion of the total area in 2_E than in 2_D. These, as well as the eroded phases, are generally placed in the Third, Fourth, or Fifth classes of soils.

Areas 2_F and 2_G are cash-grain farming sections and consist of level to gently sloping bottom and low terrace lands of the Ohio River. The bottom lands are chiefly Huntington, Lindside, and Melvin silty clay loams together with Boehne silt loam and undifferentiated sandy alluvium. The low terraces include Woodmere and Rahm silty clay loams. Much of the corn and soybeans of the county are raised here. Large-scale and power farming is carried on on the large farm units because of the favorable lay of the land. The soils of this area rate slightly higher in productivity than those of the other Second-class land areas as can be seen from table 10.

The Third-class soils are dominant in areas 3_A and 3_B. The estimated percentages of the various classes of soils included in these groups are also shown in table 12. Area 3_A is included in the urban and cash-grain farming sections in figure 3 and consists of level to undulating river terraces, except near streams where the land is sloping to hilly. The soils are chiefly of the Weinbach and Sciotoville series. Smaller areas of the Wheeling and Ginat soils are included. Area 3_B is a small one consisting of Memphis and Hosmer soils and a small amount of Vanderburgh soil. The area consists of relatively narrow, gently sloping ridge tops with hilly to steep hillsides. General farming is carried on here.

The Fourth-class soils areas, 4_A and 4_B, are the most extensive of all classes on the general physical land classification map (see fig. 4 and table 12). These two areas can be discussed together inasmuch as they contain similar soils. They consist of long narrow ridge tops with sloping to steep hillsides. The principal soils are Hosmer, Zanesville, Memphis, and Vanderburgh with some inclusions of Tilsit, Johnsburg, and alluvial soils. Large areas of eroded land are present and are a definite problem to proper land-use planning. Figure 5 shows a detailed section from area 4_A. This figure is not intended to show the same proportions of each of the different classes of land

as listed above, but merely to give a picture of the general pattern and the units comprising the area. For example, Fifth-class soils are seen to dominate instead of the Fourth-class soils. In any general map certain soil classes have to be combined with others, and when a large area is considered the proportions of the whole may be different than those of the smaller units.

Areas 4_A and 4_B are used principally for general and truck farming because of the small farm units and the limited amount of cropping land. The areas of Fourth-class land present a definite problem in land-use adjustment, because most of them are best suited for permanent pasture instead of crops. At present, however, not enough cattle or sheep are raised to require the use of this low-grade cropland for permanent pasture. Consequently, much of it is lying idle. The large areas of Fifth-class land, particularly the rough gullied and eroded lands, are adapted only to forestry.

The soil grouping shown in table 11 is based on soil characteristics as they determine productivity, problems of soil management, and the physical suitability of the individual soil types and phases for growing of crops, pasture, and forest. Figures 5 and 6 are maps of selected areas in the county to illustrate the application of this use-suitability grouping.

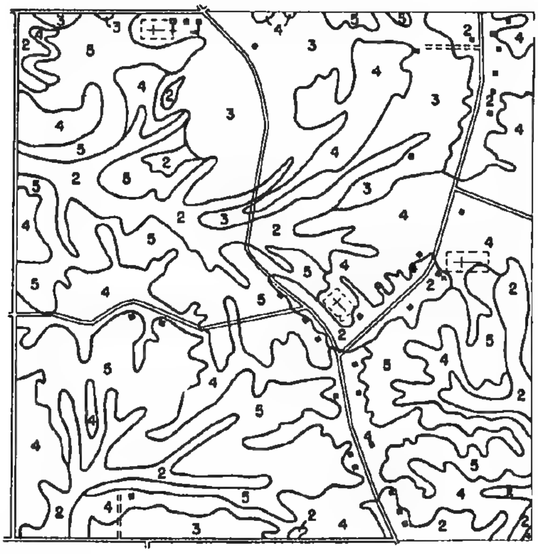

FIGURE 5.—Detailed map of soil classes or groups from area 4_A. Sec. 28, T. 5 S., R. 11 W. 2, Second-class soils; 3, Third-class soils; 4, Fourth-class soils; 5, Fifth-class soils.

Figure 5 is a section from the hilly areas (4_A in fig. 4), which are highly dissected. In general, the better crop soils are on the ridge tops or bottom lands, whereas those less suited to crops are on the steeper slopes. In most places the soil pattern is very irregular following the contours or lay of the land and not rectangular like most of the fields. Figure 6 is from an area (1_B in fig. 4), which

is an old lake plain having little or no relief. The soil pattern is simpler than that of figure 5 and is characterized by more productive soils. Taking this small section by itself, it is composed predominantly of First- and Second-class soils with a small proportion of Third class. All these soils are adapted to the raising of crops. The area represented by figure 5 is dominated by soils of the Fifth and Fourth class, which are not adapted to the raising of crops but are better suited to permanent pasture or forestry.

Detailed maps, such as those of figures 5 and 6, are of interest to individual farmers and also to groups of farmers and communities who may want to take cooperative action on problems of the best land use.

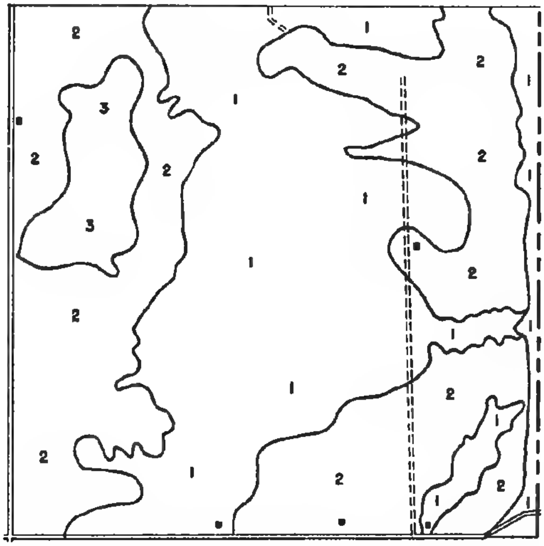

FIGURE 6.—Detailed map of soil classes or groups from area 1_B. Sec. 24, T. 5 S., R. 10 W. 1, First-class soils; 2, Second-class soils; 3, Third-class soils.

WATER CONTROL ON THE LAND

By water control is meant the control of the amount and the rapidity of surface water runoff from and subsoil drainage of soils.

EROSION

One of the chief purposes for controlling surface runoff is to keep accelerated soil erosion at a minimum. Accelerated erosion is the process by which soil or soil material is lost through the effects of man-induced changes in the ground cover. Its rate is governed by such factors as (1) the distribution and intensity of rainfall, (2) the degree of slope and area drained by each drainageway, (3) the erodibility of the soil, and (4) the type of management (i. e., whether it does or does not provide adequate vegetative cover).

Accelerated soil erosion in Vanderburgh County has been very serious, and in most places it has not yet been checked. Sheet erosion is, perhaps, the most common type of erosion. A thin layer or sheet of surface soil is removed more or less uniformly over the whole area affected. Generally, after approximately one-half of the surface soil is gone gullies begin to form.

The degree of erosion is indicated for all the soils, according to severity as measured by its effect on the productivity of the particular soil type. No designation of erosion is given to soils that are but slightly eroded or whose productivity has not been significantly reduced. The slight degree of erosion is described in the section on Soils. Eroded phases of soils include areas in which recognizable erosion has markedly reduced the thickness of the surface soil and productivity. A few short gullies are present on some of these areas. Severely eroded phases of soils include areas that have lost most of the surface soils and in which the subsoil is exposed by the plow. Gullies are a common and significant feature of most of these areas. Greatly reduced productivity, together with the greater difficulties involved in working such land, makes it unfit for continuous cultivation. Land, on which sheet erosion and gullying have progressed so far that it is not fit for agriculture and cannot be economically reclaimed, cannot be classed as a soil type but is designated as a land type—rough gullied land. Numerous gullies are deeply entrenched in the subsoil or underlying soil material. Intergully areas have lost all or most of the surface soil. Plate 2, *C* illustrates this type of erosion. The foreground shows shattered fragments of sandstone from the underlying bedrock of the Zanesville and Vanderburgh soils. Gullies keep cutting back into the hillside.

Vanderburgh County receives much of its rainfall during the spring when the land is bare and unprotected, as it is after corn is seeded, or when it is only partly protected by a winter wheat crop. The rest of the rainfall is distributed throughout the year with the least in the fall. Hard beating thundershowers are frequent. These puddle the surface soil, which forms a thin impervious crust, preventing the rain water from percolating through the soil, and allowing it to run off the surface. It is advisable to break this impact of the rains by means of vegetation or mulches of straw or leaves, Broad-leaved plants, such as trees, and thick-growing plants, such as grasses, legumes and, to a lesser extent, small grains and corn, serve this purpose.

The degree of slope, as well as its length, governs the speed of runoff. The faster the water moves off, the greater is its cutting power. Consequently, erosion on cultivated land is more severe on steep slopes than on relatively smooth slopes. Water moving down a long slope gathers speed and volume and has greater cutting power than on short slopes. Therefore, it is important to check the speed of water moving down a slope. Mechanical and vegetative means, or a combination of both, must be used for the most effective control. Most of the slopes in Vanderburgh County are relatively short so that mechanical structures, such as terraces, are less needed than close-growing vegetation.

The first step in controlling water runoff or in conservation of the land is the adoption of a suitable land-use program. In the previous section a land classification has been presented in table 11 (p. 116), which places each soil type in one of five groups on the basis of its capabilities for the production of certain plants and which will result in the conservation of the soil.

As the erodibility of all the soils in this county is very similar, the problems of conservation and maintenance of productivity are principally those brought about by the degree of slope.

Measures for controlling runoff depend on the slope of the land (see table 8). On soils whose slopes do not exceed 3 percent, runoff is not too rapid and can be controlled by proper rotations, cover crops, and plowing on the contour. On soils of gentle-slope phases, gradients of 3 to 6 percent, runoff is fairly rapid and must be slowed down, if it is to be prevented from seriously eroding the soil. This can be done by contour plowing and using cover crops in rotations. Winter cover crops are very important on soils subject to erosion. Particularly is this true where two clean-cultivated crops follow each other in a rotation as soybeans, following corn, in a corn, soybeans, wheat, and hay rotation. A cover crop of rye or vetch should be used between them.

Where the slopes are long, terracing and strip cropping may be practiced. The water-absorbing capacity and soil structure can be improved by turning under green manures, particularly legumes. On soils of slope phases, whose gradient ranges from 6 to 10 percent, the same measures as recommended for the gentle-slope phases apply, but it appears advisable to change or lengthen crop rotations so that cover crops occupy the land for longer periods of time and fewer clean-cultivated crops are grown.

On soils of hill phases, with gradients ranging from 10 to 14 percent, runoff is very rapid if not slowed down by some means. Such land should not be cultivated continuously in order to attempt the production of all the crops of the region, but it can be used for the production of hay crops, which provide a vegetative cover for the soil. Most of these slopes are too steep and too narrow for terracing. Whenever the sod is broken to renew the stand of grasses, the plowing should be done on the contour. Lespedeza has been used extensively in this county, because it makes a growth where grasses and other legumes fail. After the soil fertility has been built up, better protection can be given the land by growing red clover, alfalfa, or bluegrass. In order to grow these crops it is necessary to lime the soil first and apply liberal quantities of superphosphate. The exact requirements can be determined by quick tests performed by the county agent or the Purdue University Agricultural Experiment Station. A mixture of grasses sown with alfalfa usually affords greater protection to the soil than alfalfa alone, because the grasses fill in the bare spaces between the alfalfa plants. Where the soil conditions are favorable, Kentucky bluegrass, Canada bluegrass, white clover, and other desirable pasture plants make a good soil cover. Clipping weeds at the proper stage encourages the growth of grasses.

On soils of steep slopes ranging from 14 to 25 percent, runoff is excessively rapid. The runoff can be reduced by a permanent sod established in the manner recommended for the hill phases. In addition to protecting the soil, the vegetative cover furnishes good pasturage for cattle, but the land should not be overgrazed. Some of the steeper areas should be planted and maintained in trees. The leaves that fall from the trees form a mulch on the surface of the soil that protects the soil from washing. Furthermore, the growing leaves on the trees break the impact of hard beating rains. Reproducing timber areas should not be grazed.

The whole problem of water control is a complex one. It necessarily involves a great deal of farm planning, which can best be done by the farmers on the land. Any action program must be initiated by the farmers themselves, although they may call on various governmental agencies to assist. The question of costs always arises. Most of these have to be borne by the individual farmers. Frequently, poor crops and low incomes make it impossible to use extensive water-control measures. Market demands likewise govern to a large extent the type of crop to be grown. This factor is frequently responsible for an increased acreage of clean-cultivated crops over that of close-growing crops and for the use of submarginal land for the raising of crops.

The situation is summed up by Striker (*10, p. 23*) in Land Policy Review in these words:

> This goal of a socially more profitable and better use of land rests both upon the desire and the ability of the people to keep the land in good condition as a necessary prerequisite to a system of permanent agriculture rather than in anticipation of large immediate material rewards. If a 10- to 25-year view is taken, in many places there is less conflict than is generally supposed between a system of agriculture involving conservation and effective use and a system that gives the greatest material return.

DRAINAGE AND FLOOD CONTROL

Vanderburgh County has a large total area of land that is naturally imperfectly drained. Most of it has been artificially drained and reclaimed for cropping, so that drainage is no longer a serious problem. Extensive flats of Peoga, Zipp, Ragsdale, and Ayrshire silt loams in the northwestern part of the county have been ditched and tile-drained in order to speed surface water runoff. Construction of ditches has resulted in lowering the formerly very high water table in the Zipp and Ragsdale soils. These soils have become well drained internally and have become very productive after the water table has been lowered.

In the vicinity of Pigeon Creek are large flats of Zipp, Montgomery, McGary, Ginat, and Weinbach soils. The Zipp and Montgomery soils formerly had a high water table and have been successfully reclaimed by artificial drainage. The McGary, Ginat, and Weinbach soils have hardpans and slow internal drainage. The Ginat soil is the slowest drained soil of this group because it has the heaviest claypan.

Other naturally slowly drained soils that have been reclaimed by drainage include Johnsburg, Stendal, Inglefield, Keyesport, and

Waverly silt loams. Some areas of Waverly silt loam are not tile-drained. The Melvin soils can be reclaimed by ditching and providing adequate outlets for the water. Tile drains on the Melvin soils tend to become plugged with clay.

The city of Evansville is situated in the southern part of the county on the Ohio River. When this river reaches flood stage, water overlies all the low ground and frequently backs up into the city. To protect the city the construction of a levee was begun in 1939. Its approximate course is shown on the soil map.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of the forces of vegetation and climate acting on soil materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life in and on the soil, the relief or lay of the land, and the length of time the forces of development have acted on the material. External climate is less important in its effects on soil development than is internal soil climate, which depends not only on temperature, rainfall, and humidity, but on the physical characteristics of the soil or soil material and the relief, which, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

Vanderburgh County is in the southern part of the Gray-Brown Podzolic soil belt (*9*). Most of the county is an old plateau, highly dissected by large and small streams to form long narrow ridges and moderately steep slopes. The maximum local difference in elevations is 140 feet. Large flats border the principal streams and occupy the old lake beds. Under natural conditions, the flat areas were imperfectly and poorly drained. Artificial drainage has been established here in order to make the soils suitable for cultivation.

Most of the county is blanketed with a mantle of silty material which appears to be loess. It is thickest in the southern and western parts and thinnest in the northern and eastern parts. Part, if not all, of the loess was laid down since the time of the Illinoian glaciation. Part or all of the solums of many of the soils of the uplands has developed from the silty parent material. The zone of demarkation between what appears to be loess and what may be the weathered products of fine-grained sandstone, siltstone, and shale is not very distinct. It is probable that mineralogical studies will be necessary in order to obtain information that will aid in differentiating between these types of parent materials. The underlying strata beneath the soils of Vanderburgh County are sandstone, siltstone, and shale, with a few thin layers of limestone. In addition to the silty parent material of the uplands, large areas of soils are developed from old alluvium of the river terraces and extinct lake beds. The alluvial soils are derived from recent alluvium and show relatively little profile development. Here, the character of the parent material has been modified by drainage conditions.

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Of the soil-forming factors enumerated at the beginning of the section on Soils, climate is one of the most important. The climatic forces, together with biological influences, acting over a period of time on various kinds of parent materials similarly situated tend to overcome the characteristics of the parent material and impart very similar morphological characteristics to the resulting soils. Climate exerts both a direct and indirect effect on soil formation. Indirectly, it causes variations in plant and animal life that exist in any area; directly, it affects the type of weathering of rocks and the removal and redeposition of materials by water, wind, and glaciers. Climatic conditions, as modified by local conditions of slope, parent materials, and vegetation, control the percolation of water through the soil. The general climate of the area is approximately uniform, but the climate within the soil of any particular small area varies with the slope or lay of the land. Thus with equal rainfall and similar parent material, the soil climate generally is more humid on gentle slopes than on steep slopes and is still wetter on flats and in depressions. Because many flat areas receive moisture from the soils of steeper slopes nearby, they are able to support more vegetation as well as more varied species and hence accumulate more organic matter than many steep slopes (*1*). The normal climate of the county in conjunction with biological activities is effective in the development of the zonal soils, whereas the local soil climate is effective for the development of the intrazonal soils in this area.

It is difficult to divorce the effects of climate from those of biological activities in soil formation. In fact soil formation is not possible without the combined action of these two factors. Biological activity covers both plant and animal life and includes the activity of microorganisms. Plant and animal life furnish organic matter for the soil, bring plant nutrients from the lower layers to the upper ones, and have an important influence on the development and maintenance of soil structure. Deep-rooted plants, such as some trees and grasses, bring water from deeper horizons to the surface and into the stems or trunks and the leaves of plants. This water carries in solution a certain quantity of mineral material, particularly of soluble bases, some iron and alumina, a little silica, and smaller quantities of many other elements. When the leaves fall and the plants decay, these minerals return to the surface of the soil. Thus an upward movement of plant nutrients from the parent materials to the surface is established. This tends to keep the soils fertile.

The decay of leaves and organic matter causes the formation of organic acids, particularly carbonic acid. These acids hasten the removal of bases, so that, to a certain extent, the process of soil enrichment by upward movement through the plants is reversed. The zonal soils of the county, which are of the Gray-Brown Podzolic group, have developed under well-drained conditions on slopes sufficient to allow good but not excessive runoff. Soil-forming processes here keep pace with geologic or normal erosion so that mature normal soils, that represent the normal effects of regional climatic and biological environment, are formed. Podzolization is active in the development of the zonal and of the light-colored intra-

zonal soils of this area. It has resulted in the relative impoverishment of bases from the A horizons and the translocation of some of the clay and iron compounds from the A_2 horizon to the B horizons and into the ground water. In general, these soils possess a thin covering of leaf litter which is underlain by a thin layer of intermixed humus and mineral soil, a light grayish-brown A_1 horizon, a grayish-yellow eluviated A_2 horizon, and a brownish-yellow and yellowish-brown illuviated B horizon of subangular blocky structure.

The numerous soil types and phases of Vanderburgh County can be broadly grouped into zonal, intrazonal, and azonal young soils. The intrazonal soils are subdivided into semi-Planosols, Planosols, and Wiesenböden and Half-Bog soils. These groupings are presented in table 13. In addition the natural drainage, kind of parent materials, and type of profile are presented for each soil series. The letters designating some of the horizons as X, Y, M, U, and D are used locally in Indiana.[11]

A refers to the eluviated surface horizons, and B refers to the horizon of illuviation. X refers to the hardpan or claypan frequently present below the normal B horizon of more or less slowly drained light-colored soils. This hardpan generally is characterized by a columnar structure of various degree of distinctness with some gray silting over the tops of the columns and in the cracks, by a low pH reaction, and low content of exchangeable bases. The hardpan is silty or clayey, but it definitely hinders the downward percolation of water. The Y horizon where present, occurs below the B or X horizons and between them and the C horizon. It is defined as a horizon that is strongly weathered chemically as well as physically, whereas the weathering of the C horizon is dominantly physical.

For the alluvial soils and soils of depressions a special nomenclature is used. D represents deposits of alluvium, H represents humus or dark-colored horizons, M stands for modified mineral material, and U for relatively unmodified underlying material or rock that is not parent material of the soil.

As mentioned before, the zonal soils of the area belong to the Gray-Brown Podzolic group. The series having normally developed profiles include Memphis, Alford, Hosmer, Zanesville, Markland, and Wheeling. With the exception of the Markland series, they all have ABYC profiles. In general the A horizons are light grayish brown, the B horizons are well-oxidized having a yellowish-brown, brownish-yellow, or slightly reddish-brown color; the Y horizons are yellowish brown or brownish yellow, streaked in places with tongues of gray silt, and are slightly less heavy in texture than the B layers; and the C horizons are brownish yellow, yellow, or grayish yellow. The A, B, and Y layers are all more acid than the C layers. The C horizon of some soils is calcareous as in the Markland series. The slight tendency toward an X horizon as in the Zanesville soil represents a transition between the normal Gray-Brown Podzolic soils and the Planosols. Some of these zonal soils will be described in detail in order to bring out these characteristics.

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[11] BUSHNELL, T. M. MAP OF SOIL REGIONS AND KEY TO SOIL SERIES OF INDIANA. Ind. Agr. Expt. Sta. 1938

Table 13.—*Grouping of soils of Vanderburgh County, Ind., on the basis of profile charact*

Order	Suborder	Soil group	Soil series	Natural drainage	Pro
Zonal soils	Light-colored podzolized soils of gently sloping and rolling areas	Gray-Brown Podzolic	Memphis	Medium-rapid external and internal.	ABYC
			Alford	do	ABYC
			Hosmer	do	ABXYC (
			Zanesville	do	ABXYC (
			Markland	do	ABC
			Wheeling	do	ABYC
			Vanderburgh	Excessively rapid runoff	Shallow A AC).
Intrazonal soils	Light-colored podzolized, hydromorphic soils of flat or slightly sloping areas	Half-Planosol	Iona	Medium external and slow internal	ABYC
			Woodmere	do	D/ABYC
		Planosol	Tilsit	do	ABXYC
			Sciotoville	do	ABXYC
			McGary	Slow external and internal	ABC
			Ayrshire	do	ABYC
			Johnsburg	do	ABXYC
			Weinbach	do	ABXYC
			Rahm	do	D/ABXY
			Ginat	Very slow external and internal (wet and dry)	AXYC
			Peoga	do	AXYC
	Hydromorphic soils of seep and depressional areas.	Wiesenböden and Half-Bog.	Ragsdale	Very slow throughout (permanently wet)	HMU
			Montgomery	do	HMU
			Zipp	do	HMU
			Lyles	do	HMU
Azonal soils and young soils.		Alluvial soils	Huntington	Medium internal	AC
			Lindside	Slow	AC
			Melvin	Very slow	AC
			Boehne	Excessive internal	AC
			Sandy alluvium	do	D/AC
			Pope	Medium internal	AC
			Stendal	Slow internal	AC
			Waverly	Very slow internal	AC
			Adler	Slow internal	AC
			Inglefield	Very slow internal	AC

			Algiers	Slow internal	D/HMU
			Memphis (colluvial phase)	do	AC
			Keyesport	do	AC

[1] The significance of the letters in the profile formulas is explained in the text (p. 131).

Memphis silt loam is a normal soil developed on loess. Following is a description of a profile observed south of Burdette Park in the SE¼ sec. 4, T. 7 S., R. 11 W.:

A_{00}. A thin layer of surface litter composed of leaves, twigs, and leafmold.

A_{11}. 0 to ½ inch, dark-gray silt loam. The dark color is due to the presence of organic matter.

A_{12}. ½ to 3 inches, grayish-brown very fine granular silt loam.

A_2. 3 to 9 inches, light grayish-yellow friable silt loam of very thin indistinctly developed platy structure. The layer presents a vesicular appearance.

B_1. 9 to 12 inches, light brownish-yellow friable heavy silt loam, which breaks into small subangular fragments one-eighth inch or less in diameter. This horizon is slightly porous in appearance.

B_2. 12 to 30 inches, yellowish-brown friable silty clay loam, which breaks readily into subangular aggregates one-fourth to one-half inch in size. The aggregates are more angular in the lower part. The faces of these aggregates are coated with reddish-brown colloidal material, which imparts a reddish cast to this layer. They can be crushed with slight pressure into an amorphous mass.

Y_1. 30 to 54 inches, brownish-yellow friable heavy silt loam containing some small specks of mica and a very few small iron concretions.

Y_2. 54 to 80 inches, light brownish-yellow massive silt loam. Mica specks are slightly more conspicuous than in the Y_1 horizon.

Y_3. 80 to 130 inches, similar to the Y_2 horizon, but slightly more silty.

Y_4 130 to 150 inches, grayish-yellow soft silt loam with some mica specks faintly visible.

C_1. 150 to 190 inches, grayish-yellow soft silt loam containing a few iron stains along rootlet channels. The material appears slightly porous. Some mica specks are perceptible.

U_1. 190 inches +, residual material of sandstone and shale.

Alford silt loam resembles Memphis silt loam throughout most of the horizons but is slightly heavier and more compact in the B and Y horizons. In an old cultivated field on the county line road in the NW¼ sec. 19, T. 4 S., R. 11 W., the following profile was observed:

A_1. 0 to 2 inches, pale grayish-brown mellow silt loam that appears slightly porous.

A_2. 2 to 8 inches, pale grayish-brown friable silt loam of very thin platy structure.

A_3. 8 to 11 inches, grayish-yellow slightly compact but friable silt loam exhibiting an indistinctly developed very thin platy structure. This horizon has a vesicular appearance.

B_1. 11 to 14 inches, brownish-yellow friable heavy silt loam that breaks readily into subangular aggregates about one-fourth inch in diameter. The faces of these fragments, root channels, and cracks have a very thin coating of yellowish-gray material.

B_{21}. 14 to 25 inches, light yellowish-brown friable silty clay loam that breaks along regular cleavage planes into subangular and angular fragments one-fourth to one-half inch in diameter. The faces of these fragments are lightly coated with reddish-brown colloidal material. They can be crushed with slight pressure into an amorphous mass. Grayish-yellow colloidal material coats the cracks and rootlet channels.

B_{22}. 25 to 37 inches, bright yellowish-brown friable silty clay loam of same structure as horizon above, except that the aggregates are slightly more firm, require more pressure to crush, and are slightly more reddish, owing to the coating of reddish-brown colloidal material on the faces of the aggregates.

Y_1. 37 to 50 inches, brownish-gray somewhat compact but friable silt loam, containing some streaking of rust brown This horizon has a vesicular appearance

Y_2. 50 to 70 inches, brownish-yellow somewhat compact but friable silt loam material, containing streakings of rust brown and some small concretions of iron or manganese.

Y_3. 70 to 76 inches, grayish-yellow silt loam that appears to have no structure. It is streaked with iron stains and contains some small concretions of iron.

C_1. 76 inches +, yellow or grayish-yellow faintly calcareous silt loam.

The Hosmer and Zanesville soils have many characteristics in common and together cover a large part of the uplands within the county. They are most characteristically developed on slopes of 3 to 6 percent. On steeper slopes the A and B horizons generally are thinner. Both Hosmer and Zanesville silt loams in this county are developed from deep silts overlying sandstone, siltstone, and shale, but the silts average about twice as deep in the Hosmer as in the Zanesville soil. In general, the thickness of this silt decreases within the county from west to east. Following is a description of a profile of Hosmer silt loam observed in the southwestern part of the county in a wooded area on the east side of the road to Kasson in the SW¼ sec. 17, T. 6 S., R. 11 W.:

A_{11}. 0 to 1 inch, dark-gray very fine granular silt loam. The dark color is due to the presence of organic matter formed from the decomposition of leaves and twigs.

A_{12}. 1 to 3 inches, gray to grayish-brown loose and mellow silt loam of very thin platy structure.

A_2. 3 to 8 inches, light grayish-brown to grayish-yellow friable silt loam having a very thin platy structure.

B_1. 8 to 11 inches, brownish-yellow slightly compact heavy silt loam that is very friable and breaks into small subangular fragments one-eighth to one-fourth inch in diameter.

B_2. 11 to 26 inches, brownish-yellow friable silty clay loam that breaks readily into subangular fragments one-fourth to one-half inch in diameter. These fragments can be crushed into an amorphous mass with pressure. The faces of these fragments are thinly coated with grayish-yellow colloidal material.

B_3. 26 to 30 inches, light brownish-yellow friable heavy silt loam of similar structure and aggregate size as the B_2 horizon but less distinctly developed. The aggregates can be crushed with pressure and show a slight coating of reddish-brown on the faces.

X_1. 30 to 36 inches, yellow compact silt loam that breaks out into subangular and angular aggregates one-half to three-fourths inch in size. The faces of these aggregates are coated with gray silt. Some small concretions of iron are present in this horizon.

X_2. 36 to 45 inches, yellow compact silt loam that breaks into irregular clods 1 to 6 inches in size. The faces of these clods are coated with gray silt material. This horizon is lightly stained with iron and contains some iron concretions.

Y_1. 45 to 64 inches, yellow to grayish-yellow silt loam that is streaked with tongues of gray silt and highly stained with rust brown, particularly along rootlet channels. It can be broken into massive lumps.

Y_2. 64 to 112 inches, grayish-yellow silt loam similar to the Y_1 horizon but slightly less stained with rust brown.

Y_3. 112 to 136 inches, grayish-yellow silt loam containing some streaks and faint mottles of gray and rust brown. This horizon is slightly gritty and probably is an old surface soil weathered from bedrock and then covered with loess.

U. 136 inches +, subtratum of definitely residual material consisting of reddish-brown and yellow disintegrated and chemically weathered sandstone, siltstone, and shale.

The profile of Zanesville silt loam is very much like that of Hosmer silt loam except that the thickness of silt over material that can be definitely identified as residual is approximately 5 feet. Zanesville has a less heavy B horizon than the Hosmer (see table 14), but in both soils this characteristic varies somewhat from place to place.

The slope phase of Zanesville silt loam is mapped on slopes ranging from 6 to 10 percent. The solum and depth to bedrock is shallower than in typical Zanesville silt loam. The X horizon appears at a depth ranging from 16 to 20 inches.

Markland silt loam is a well-developed soil derived from calcareous backwater deposits of the Wisconsin glacial epoch. It has an ABC profile. Following is a description of a profile of Markland silt loam as observed in an old field in the southern part of the county near Little Pigeon Creek in the SE¼ sec. 5, T. 6 S., R. 10 W.:

A_1. 0 to 2 inches, grayish-brown mellow silt loam of very thin platy structure.
A_2 2 to 7 inches, grayish-brown slightly compact silt loam having a very thin platy structure which is indistinctly developed. Strongly acid in reaction.
B_2. 7 to 16 inches, yellowish-brown silty clay loam that breaks into subangular and angular aggregates one-fourth to one-half inch in diameter. These aggregates are fairly resistant to crushing. Strongly acid in reaction.
B_3. 16 to 24 inches, dull-brown tight silty clay loam that breaks into sharply angular blocks 1 to 2 inches in size. The faces of these blocks are coated with grayish-brown sticky colloidal material. The blocks can be crushed by hand only with great pressure. This horizon is neutral in reaction.
C_1. 24 to 36 inches, brownish-yellow and grayish-brown streaked silty clay loam having no well-defined structure. Some concretions of calcium carbonate are present in this horizon.
C_2. 36 inches +, grayish-yellow friable calcareous silt loam.

The Wheeling soils are developed from old alluvium deposited by the Ohio River. The silt loam, loam, and fine sandy loam types are recognized. The Wheeling loam has good internal drainage and a slightly more oxidized B horizon than Wheeling silt loam. Wheeling fine sandy loam has excessive internal drainage, owing to the presence of a sandy substratum at a relatively shallow depth.

The following is a description of a profile of Wheeling silt loam, as observed on South Weinbach Avenue in the SW¼ sec. 3, T. 7 S., R. 10 W.:

A_1. 0 to 2 inches, grayish-brown mellow silt loam of very thin platy structure. It is strongly acid in reaction.
A_2. 2 to 9 inches, grayish-brown mellow silt loam of very thin platy structure that is indistinctly developed. This horizon is strongly acid in reaction.
B_1. 9 to 12 inches, light brownish-yellow compact, but friable heavy silt that breaks into indistinct subangular aggregates up to one-fourth inch in diameter. The aggregates crush very readily. This horizon is likewise strongly acid in reaction.
B_{21}. 12 to 28 inches, yellowish-brown friable silty clay loam that is very slightly plastic when wet. It breaks into subangular fragments one-half to three-fourths inch in diameter. The faces of these aggregates are coated with reddish-brown colloidal material which imparts a slightly reddish cast to this horizon that is accentuated when wet. They are crushed only with difficulty. This horizon is very strongly acid in reaction.
B_{22}. 28 to 45 inches, yellowish-brown friable silty clay loam that breaks into coarse blocky fragments. The faces of some of the fragments are coated with some black colloidal material. Some gray silt streaking is present between the cracks. This horizon is very strongly acid in reaction.
Y_1. 45 to 52 inches, brownish-yellow very friable silt loam that is slightly streaked with reddish-brown colloidal material. It is strongly acid in reaction and presents a vesicular appearance.
C_1. 52 to 70 inches, brownish-yellow friable very fine sandy loam containing some concretions of manganese. It is less acid in reaction than the horizon above it.
C_2 70 inches +, brownish-yellow or reddish-brown stratified sands.

Vanderburgh silt loam is a shallow soil associated with Zanesville silt loam but occurs on steep slopes. It has thin A and B horizons. The depth to bedrock varies with the position on the slope, being deepest near the top and shallowest at the base. Near the base of steep slopes some areas of an AC soil are included. The Vanderburgh soil occurs on slopes ranging from hilly to very steep.

The intrazonal soils may be associated with two or more zonal groups. Their soil characteristics reflect the dominating influence of some local factor, such as imperfect drainage caused by a lack of slope, impervious parent material, or age in place, over the normal effect of climate and vegetation. In the intrazonal soils are included the semi-Planosols, Planosols, and Wiesenböden, and Half-Bog soils. The soil series included under each of these intrazonal groups are related to each other in morphological characteristics. The semi-Planosols of this county are transitional between the Gray-Brown Podzolic soils and the true Planosols. They are slightly grayer in the A horizon and paler or lighter in the B horizon than are the zonal soils, but they do not have as heavy or hard siltpans or hardpans as the Planosols. The semi-Planosols include the Iona and Woodmere series.

The Iona soils have an ABYC profile with a faint indication of an X horizon; and the Woodmere soils have a deposit of recent alluvium over an old soil and an ABYC profile with a suggestion of an X horizon in places. Iona silt loam, where it occurs in the northwestern part of the county, is intermediate in drainage and geographic position between the Alford and the Ayrshire soils. Like the Ayrshire it is derived from calcareous silt deposits, whereas the silty parent material of Alford soils contains little or no free calcium carbonate. It has an ABYC profile, even though it occurs on nearly level land. It is probable that the higher content of lime in the parent material has inhibited to some degree the hydrolysis of the clays; consequently, leaching has not resulted in translocation and concentration of clay in the X horizon as is typical of most Planosols. This soil has a grayish-yellow surface soil and a pale-yellow subsoil that breaks into small subangular aggregates. The faces of the aggregates are coated with reddish-brown colloidal material, which imparts a brownish cast to the subsoil.

Woodmere silty clay loam is placed in the semi-Planosol group because of the nature of the subsoil, which is faintly mottled with gray at depths below 24 inches. It generally occurs on fairly level areas on low terraces, and is subject to occasional inundation. High waters in 1913 and 1937 have left a deposit of sweet alluvium over an old acid soil very much like Sciotoville silt loam. It has a dark grayish-brown silty clay loam surface soil and a yellowish-brown or brownish-yellow silty clay loam subsoil that has a slight reddish cast.

The Planosols occur on flat or nearly flat areas that allow slow runoff. They are alternately wet and dry for relatively long periods of time, according to the season. The soils have been subjected to leaching and eluviation, which may be considered as a kind of podzolization. The effect has been to produce soils with grayish-yellow or light-gray surface soils and yellow and gray mottled subsoils. This is true for the Planosols having ABC, ABYC, and

ABXYC profiles. For the soils having AXYC profiles, podzolization has been the soil-forming process leading to the development of the A and X horizons. Gleization may be responsible in part for the gray and rust-brown Y horizons.

Included in the Planosol group are the Tilsit, Sciotoville, McGary, Ayrshire, Johnsburg, Weinbach, Ginat, and Peoga silt loams and Rahm silty clay loam. The type of profile possessed by each is shown in table 13.

Tilsit silt loam will be described in detail as being characteristic of the better drained soils in this group. This profile was observed in a seeded area in the northeastern part of the county on the north side of Volkmann Road in the SW¼NW¼ sec. 28, T. 4 S., R. 10 W.

A_1. 0 to 6 inches, light grayish-brown loose silt loam of very fine granular structure.

A_2. 6 to 10 inches, light grayish-brown slightly compact but friable silt loam. It has a vesicular appearance.

B_1. 10 to 13 inches, pale-yellow compact but friable silt loam that breaks into subangular fragments about one-fourth inch in diameter. Faint concretions of iron oxide the size of a pinhead are present throughout.

B_2. 13 to 20 inches, pale-yellow friable heavy silt loam that breaks into subangular and angular fragments one-fourth to one-half inch in diameter. Concretions of iron oxide the size of a pinhead are more numerous in this horizon than the one above.

X_1. 20 to 28 inches, mottled gray and yellow silty clay loam that forms a compact horizon, but breaks readily into blocky fragments ¾ to 1¼ inches in diameter. It is streaked with tongues of gray silt along old root channels and in cracks. This horizon is very strongly acid in reaction.

X_2 28 to 34 inches, gray and rust-brown mottled silty clay loam that breaks into small angular fragments. This layer is slightly plastic when wet.

Y_1. 34 to 45 inches, gray and rust-brown mottled silt loam that is compact and indurated when dry. Concretions of iron, as well as streaks of gray silt, are conspicuous in this horizon.

Y_2. 45 to 60 inches, gray and rust-brown mottled silt loam, similar to Y_1, but with less gray silting. Slightly less acid in reaction than horizon immediately above.

Y_3. 60 to 84 inches, rust-brown and gray mottled compact silt loam containing soft concretions of iron or manganese oxide. The reaction is less acid than in the Y_2 horizon.

C_1. 84 to 96 inches, yellow silt loam with tongues of gray silt, slightly acid in reaction

C_2. 90 inches +, underlying material of partly disintegrated sandstone, siltstone, and shale.

Sciotoville silt loam is developed from old alluvium and is associated with the Wheeling and Weinbach soils. In the upper part of the profile it resembles the Tilsit soils in color and texture.

McGary silt loam and Ayrshire silt loam are only two soils of this group that lack an X horizon. The parent material of each of these soils is calcareous. The B horizon of McGary silt loam passes directly into the C horizon. The transition is accompanied by a marked change in the soil reaction.

The following is a profile description of Ayrshire silt loam, as observed in the northwestern part of the county on the north side of Schmitt Road in the SW ¼ sec. 19, T. 4 S., R. 11 W.:

A_1. 0 to 1 inch, light brownish-gray loose and mellow silt loam.

A_{21} 1 to 6 inches, light-gray loose mellow silt loam.

A_{22}. 6 to 10 inches, light-gray silt loam, having an indistinctly developed very thin platy structure.

A_{23}. 10 to 11 inches, light-gray compact but friable silt loam, similar in structure to the A_{22} horizon.

A_3. 11 to 14 inches, yellow and light-gray mottled compact but friable heavy silt loam, having a very fine blocky structure. The aggregates are fairly firm and are coated with light-gray colloidal material which gives this horizon a mottled appearance.

B_1. 14 to 18 inches, yellow silty clay loam that is brittle when dry and friable when wet. This horizon breaks out into angular and subangular fragments, one-fourth to one-half inch in diameter, which are coated with light-gray colloidal material. These fragments are very distinctly developed and can be crushed with moderate pressure into a yellow homogeneous mass.

B_2. 18 to 30 inches, brownish-yellow friable silty clay loam that breaks readily into blocky fragments ranging in size from ¾ to 1½ inches. The faces of these aggregates are coated with dark grayish-brown colloidal material, which imparts a dark color to this horizon.

Y_1. 30 to 34 inches, brownish-yellow friable heavy silt loam that breaks into soft blocky fragments as does the B_2 horizon. Some brown colloidal material appears on the faces of these fragments.

Y_2. 34 to 45 inches, yellow compact but friable silt loam. It is stained with rust brown along rootlet channels, which appear to be numerous in this horizon. No definite structure is apparent, but the material breaks into very coarse blocks.

C_1. 45 inches +, yellow to grayish-yellow calcareous silt loam that contains some iron and manganese stains. Concretions or nodules of lime are scattered throughout. With increasing depth the gray color becomes more pronounced.

In table 14 (p. 143) are shown the mechanical analysis for Ayrshire silt loam. It is seen that the greatest concentration of clay appears between depths of 18 and 30 inches designated as the B_2 horizon. It seems apparent that some translocation of clay has taken place from the A horizons and in decreasing amounts in the Y horizons. A sharp drop in the clay content is evidenced in the C horizon. It is probable that less hydrolysis of the coarser separates and minerals has taken place, owing to the slightly alkaline reaction of this horizon, and it is also entirely possible that the C horizon is different material deposited either by wind or water at some different geologic epoch than the one in which the upper layers were laid down.

This soil occupies the bed of an extinct lake that appears to have been covered by loess. The C horizon may, then, consist of old water-laid materials, whereas the material above it probably was laid by the wind. The rather sharp decrease in the percentages of fine gravel, coarse sand, and medium sand between the A_3 and B_1 horizons probably is due to the fact that these coarse materials are largely concretionary.

Johnsburg silt loam, a Planosol member of the Zanesville catena, will be described in detail as typical of the more poorly drained ABXYC soils of this group. This profile was observed on the east side of Browning Road in the NW¼ sec. 28, T. 4 S., R. 10 W.

A_1. 0 to 2 inches, light-gray to light brownish-gray loose silt loam.

A_2. 2 to 8 inches, light-gray slightly compact but friable silt loam.

A_3. 8 to 12 inches, light grayish-yellow compact silt loam of indistinctly developed very thin platy structure. A few concretions of iron the size of a pinhead are perceptible.

B_2. 12 to 18 inches, grayish-yellow friable heavy silt loam, containing some concretions of iron oxide the size of a pinhead. This layer breaks into subangular fragments one-fourth to one-half inch in diameter. These fragments can be broken with moderate pressure

X. 18 to 30 inches, yellow friable silty clay loam containing numerous concretions of iron or manganese oxide. This layer is streaked with gray silt along cleavage cracks. It breaks into coarse blocky aggregates whose

faces are thinly coated with brown colloidal material. This horizon is the most acid layer in this soil.

Y_1. 30 to 48 inches, yellow and gray mottled silt loam. This layer is heavily stained with iron oxide along rootlet channels and contains some black concretions of iron oxide, presenting a reticulately mottled appearance. Tongues and streaks of gray silt are present along vertical cracks and along the walls of old tree-root channels.

Y_2. 48 to 60 inches, gray and rust-brown mottled compact silt loam.

C_1. 60 inches +, grayish-yellow silt loam containing some iron or manganese oxide concretions.

Weinbach silt loam is developed from old alluvium of the Ohio River. It is somewhat better drained than Ginat silt loam with which it is associated but is not so well drained as Sciotoville silt loam. Weinbach silt loam has a slightly grayer X horizon than that of Johnsburg silt loam just described.

Rahm silty clay loam resembles Weinbach silt loam in the lower horizons but differs from it in having a deposit of recent alluvium on the surface. In this respect it is similar to Woodmere silty clay loam, with which it is associated. However, the Rahm soil is not so well drained as the Woodmere soil, being highly mottled with gray and rust brown in the subsoil.

The Ginat and Peoga soils are the slowest drained members of this group. They are developed on flats but from different parent materials. They have similar color profiles and somewhat similar structure profiles. Ginat silt loam profile (described in detail because it is typical of the soils having AXYC profiles in this area) was observed on Alvord Boulevard in the NW¼ sec. 3, T. 7 S., R. 10 W.

A_1. 0 to 6 inches, gray and rust-brown mottled compact but friable silt loam. The rust-brown stains appear to be confined to rootlet channels.

A_2. 6 to 8 inches, light-gray and rust-brown mottled heavy silt loam.

X_1. 8 to 18 inches, gray and rust-brown mottled silty clay loam that is slightly plastic. It has a coarse prismatic structure and firm aggregates. Streaks of gray silt, iron stains, and roots penetrate between the cleavage cracks.

X_2. 18 to 30 inches, dark-gray and rust-brown mottled plastic silty clay of coarse blocky structure, having firm and distinctly developed aggregates.

Y_1. 30 to 60 inches, medium-gray and rust-brown mottled silty clay with no definite structure.

Y_2. 60 to 96 inches, rust-brown and gray mottled plastic silty clay. Some micaceous fragments are perceptible.

C_1. 96 inches +, stratified layers of gray and rust-brown mottled silts, silty clays, and clays.

The Wiesenböden and Half-Bog soils are the dark-colored soils of poorly drained depressions and are characterized by a high humus content in the upper horizons and a gray color in the wet subsoils. It is assumed that the original vegetation of Wiesenböden was of the marshy type, whereas that of the Half-Bog soils was swamp forest. It is not easy to distinguish one from the other after a long period of cultivation. Indiana soil scientists speak of both as having "HMU" profiles, where the H stands for humus, M for modified mineral material, and U for underlying material. The M horizon in most of the soils of this group has a blocky structure. Both the M and U horizons are generally waterlogged and can be thought of as glei layers. The soil series included in this group are Ragsdale, Montgomery, Zipp, and Lyles.

Lyles silty clay loam profile (described in detail because laboratory data are available as shown in table 14 (p. 143), was observed in a

wooded area on the east side of Woods Road in the NE¼ sec. 20, T. 4 S., R. 11 W.

$H_{1\,1}$. 0 to ¼ inch, dark-gray finely granular silty clay loam.
$H_{1\,2}$. ¼ to 6 inches, dark brownish-gray compact silty clay loam that has an indistinctly developed thin platy structure.
$H_{1\,3}$. 6 to 14 inches, gray and rust-brown mottled heavy silt loam that breaks into coarse blocky fragments.
M_1. 14 to 24 inches, medium-gray and rust-brown mottled silty clay loam that breaks into large blocky fragments.
M_2. 24 to 50 inches, bluish-gray or medium-gray and rust-brown mottled plastic silty clay loam.
U. 50 inches +, gray, grayish-yellow, and rust-brown mottled plastic silty clay loam that is waterlogged.

It can be seen from the mechanical analyses presented in table 14 (p. 143) that the clay content varies from horizon to horizon, being highest in the layer between depths of 24 to 50 inches. The sample of this soil collected for analyses varied from pH 5.1 at the surface to pH 6.0 at a depth of 50 inches. Actually, most of the soil of this type has only a medium to slightly acid reaction in the H horizon and is neutral in the U horizon. In practical mapping it is not possible to hold the soil to so close a pH range. Probably the acidity of the soil has been increased by recent additions of a small amount of acid alluvium on the surface. This soil and others of this group are generally continuously wet in their natural state. The variation in clay content can probably be attributed to variations in composition of the original sediments deposited here.

Zipp silt loam resembles Lyles silty clay loam in appearance of horizons below a depth of 6 inches, but in places the reaction is more nearly neutral in the upper layers. It occurs in the same geographical area as the Lyles soil, associated with Ragsdale silt loam, but is not subject to as frequent flooding from backwaters as is Lyles silty clay loam.

Zipp silty clay loam likewise resembles Lyles silty clay loam in appearance, but the lower layers are dominantly yellowish gray and rust brown mottled. It is only medium to slightly acid in the upper layers and is calcareous below a depth of 50 to 60 inches. This soil has a high water table, and it is associated with Montgomery silty clay loam, which has a slightly darker surface color and contains more organic matter.

The darkest colored soil of the county is Ragsdale silt loam. It is associated with Zipp and Ayrshire silt loams in depressions or basinlike areas. The following is a detailed description of Ragsdale silt loam as observed in a meadow in the SW¼ sec. 20, T. 4 S., R. 11 W.

$H_{1\,1}$. 0 to 2 inches, dark-gray granular mellow silt loam that is nearly black when wet.
$H_{1\,2}$. 2 to 8 inches, dark-gray mellow silt loam having a thin platy structure.
$H_{1\,3}$. 8 to 20 inches, dark-gray compact but friable silt loam that breaks into subangular fragments one-fourth to three-eighths inch in diameter.
M_1. 20 to 32 inches, yellow silty clay loam with heavy streaks of gray silt between cracks and along root channels. The soil material breaks into blocky aggregates ½ to 1½ inches in diameter. The faces of the blocks are coated with gray colloidal material.
M_2. 32 to 45 inches, yellow friable silt loam with reticulate network of gray silt along rootlet channels. Some gray tongues of silt appear in larger root channels. Many stains and some concretions of iron oxide are present in this horizon.

U. 45 inches +, grayish-yellow silt loam mottled with rust brown and lightly streaked with gray silt. This horizon is calcareous.

The soil is slightly acid to neutral in the upper layers.

The alluvial soil comprises azonal and young soils that originated from recently deposited water-laid materials and show little profile development except a change in color of horizons, owing to differences in drainage conditions. They are immature or young soils on which the soil-forming processes have not acted sufficiently long to alter the character of the parent material greatly. They are grouped into catenas on the basis of parent materials (see table 6, p. 30). A catena of soils is composed of a number of soil series developed from similar parent material. Each of the soil series has color-profile characteristics, owing to differences in drainage conditions.

The Huntington catena consists of Huntington, Lindside, and Melvin series. These soils are derived from alluvium washed from limestone, shale, and sandstone uplands and deposited by the Ohio River. Most of these deposits are heavy in texture, except those nearest the stream channels where considerable sand may be intermixed. None of the members of this catena are more than medium acid in reaction, and some are neutral or slightly alkaline.

The Huntington soils are well drained, the Lindside intermediately drained, and the Melvin slowly drained. Boehne silt loam is associated with Huntington silt loam and resembles it in the upper part of the profile. It differs from Huntington silt loam in having a sandy substratum at a depth ranging from 12 to 24 inches.

Sandy alluvium is the result of recent floods. Fast-moving waters sweeping over the Ohio River flood plain have left thick deposits of sand over Huntington or Lindside soils. These deposits are as much as 6 feet thick nearest the stream channels, but their depth is not invariable and they are not necessarily permanent. Subsequent floods may remove them entirely in some places or thin them in other places.

The Philo, Stendal, and Waverly soils occur on the broad silty stream bottoms of the county, and are derived from acid silts washed principally from silty upland soils. These soils are strongly acid to a depth ranging from 36 to 54 inches. The substratum below this depth in places is only slightly acid to neutral in reaction. The stream valleys are continually aggrading. This process is particularly noticeable in the narrow stream valleys where the alluvial soils resemble the material of the uplands. Philo silt loam is imperfectly drained, Stendal silt loam is slowly drained, and Waverly silt loam is very slowly drained. All three soils are light colored.

Adler and Inglefield silt loams are much like the Philo and Stendal silt loams, respectively, but are neutral or only slightly acid in reaction. They occur chiefly in the southern part of the county on narrower bottoms than do Philo, Stendal, and Waverly. The parent material consists of wash from somewhat calcareous materials of the uplands. Some of the higher pH values can be attributed to seepage waters coming from calcareous silts and siltstones or from limestone formations.

Algiers silt loam and its colluvial phase consist of a wash of silty alluvium overlaid on a dark-colored soil resembling Montgomery or Ragsdale soils. The deposition varies in thickness from 6 to 16 inches. It appears that subsequent to the formation of the dark-

TABLE 14.—*Mechanical analyses of certain soils in Vanderburgh County, Ind.*

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
Hosmer silt loam:	*Inches*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
286007	0–1	0.1	0.3	0.3	1.2	2.0	85.6	10.5
286008	1–3	.1	.3	.2	.4	1.0	86.4	11.6
286009	3–8	.1	.2	.2	.4	1.1	84.4	13.6
286010	8–11	.0	.1	.1	.3	.9	75.6	23.0
286011	11–26	.0	.0	.1	.1	.7	69.1	30.0
286012	26–30	.0	.1	.1	.2	1.0	76.5	22.1
286013	30–36	.0	.1	.1	.2	1.0	79.8	18.8
286014	36–45	.0	.1	.1	.3	1.3	75.4	22.8
286015	45–64	.0	.0	.1	.2	1.4	79.8	18.5
286016	64–112	.0	.1	.1	.4	2.0	81.1	16.3
286017	112–136	.9	1.0	.5	1.7	6.7	71.4	17.8
286018	136+	5.9	5.6	2.8	6.1	13.1	35.1	31.4
Zanesville silt loam								
2860234	0–4	.1	.3	.3	.8	2.0	86.0	10.5
2860235	4–10	.0	.1	.2	.4	1.7	84.5	13.1
2860236	10–13	.0	.0	.1	.1	1.0	78.0	20.8
2860237	13–22	.0	.1	.1	.2	.8	75.9	22.9
2860238	22–28	.0	.1	.2	.4	1.1	76.3	21.9
2860239	28–36	.0	.1	.2	.5	1.3	77.5	20.4
2860240	36–44	.0	.2	.3	.7	1.5	84.3	13.0
2860241	44–50	.0	.2	.3	.9	2.4	77.2	19.0
2860242	50–60	.0	.1	.2	1.4	5.9	74.8	17.6
2860243	60–96	.1	.4	.4	6.3	25.2	53.6	14.0
Vanderburgh silt loam								
2860228	0–5	.2	.3	.9	5.8	3.6	75.8	13.4
2860229	5–7	.0	.2	.8	5.9	3.7	73.6	15.8
2860230	7–18	.1	.3	1.2	10.7	6.2	55.3	26.2
2860231	18–25	.2	.5	1.8	17.3	9.1	46.7	24.4
2860232	25–32	.9	.8	2.1	22.9	12.2	39.7	21.4
2860233	32+	1.0	1.1	1.9	27.1	15.8	33.7	19.4
Memphis silt loam								
286019	0–½	.2	.8	.7	1.7	3.8	81.7	11.1
286020	½–3	.1	.1	.1	.5	1.5	85.9	11.8
286021	3–9	.0	.1	.1	.4	1.5	83.6	14.3
286022	9–12	.0	.0	.1	.2	.7	79.1	19.9
286023	12–30	.0	.0	.1	.1	.8	68.6	30.4
286024	30–54	.0	.0	.2	.2	1.2	77.7	20.7
286025	54–80	.0	.0	.1	.2	1.4	82.8	15.5
286026	80–130	.0	.0	.2	.1	1.0	88.5	10.2
286027	130–150	.0	.0	.1	.1	1.0	96.7	2.1
286028	150–190	.1	.1	.1	.1	1.0	90.6	8.0
286029	190+	.5	2.8	3.6	5.1	4.2	61.0	22.8
Alford silt loam								
2860212	0–2	.3	.3	.3	.9	1.2	83.7	13.3
2860213	2–8	.0	.2	.3	.7	1.1	84.1	13.6
2860214	8–11	.0	.1	.2	.5	.8	82.4	16.0
2860215	11–14	.0	.1	.1	.2	.6	75.7	23.3
2860216	14–25	.0	.0	.1	.1	.6	65.9	33.3
2860217	25–37	.0	.0	.1	.1	.8	67.7	31.3
2860218	37–50	.0	.1	.1	.2	1.4	69.8	28.4
2860219	50–70	.0	.1	.1	.4	1.3	77.4	20.7
2860220	70–76	.0	.1	.1	.2	.6	84.5	14.5
Ayrshire silt loam:								
286066	0–1	.6	.9	.6	1.1	1.6	86.5	8.7
286067	1–6	.4	.7	.6	.9	1.2	86.9	9.3
286068	6–10	.4	.7	.6	.8	1.2	86.1	10.2
286069	10–11	.6	1.0	.7	.8	1.1	83.7	12.1
286070	11–14	.4	.7	.6	.8	1.3	78.4	17.8
286071	14–18	.1	.4	.3	.6	1.0	66.8	30.8
286072	18–30	.0	.1	.2	.5	1.0	61.7	36.5
286073	30–34	.1	.1	.2	.5	1.1	69.6	28.4
286074	34–45	.1	.1	.1	.3	1.2	71.2	27.0
286075	45+	.3	.7	.3	.4	1.2	87.3	9.8
Lyles silty clay loam:								
2860160	0–¼	.3	.5	.3	.7	.7	57.0	40.5
2860161	¼–6	.1	.2	.2	.7	1.2	66.3	31.3
2860162	6–14	.3	.3	.3	1.4	1.9	73.0	22.8
2860163	14–24	.0	.1	.2	.6	1.4	63.8	33.9
2860164	24–50	.1	.3	.2	.8	1.1	59.6	37.9
2860165	50+	.1	.4	.2	.5	.6	64.7	33.5
Woodmere silty clay loam								
286001	0–10	.2	.5	.4	.9	1.1	62.6	34.3
286002	10–18	.0	.3	.6	1.3	2.3	57.9	37.6
286003	18–24	.1	.4	.7	.7	3.9	59.0	35.2
286004	24–36	.0	.0	.1	.5	2.5	59.6	37.3
286005	36–48	.0	.1	.2	.7	2.6	63.6	32.8
286006	48–96	.0	.1	.2	.6	2.0	68.6	28.5

Table 15.—*pH determinations of samples of several soils from Vanderburgh County, Ind.*[1]

Soil type and sample No.	Depth	pH
	Inches	
Memphis silt loam		
286019	0–½	5.4
286020	½–3	5.6
286021	3–9	4.8
286022	9–12	4.6
286023	12–30	4.2
286024	30–54	4.4
286025	54–80	4.3
286026	80–130	4.3
286027	130–150	5.8
286028	150–190	7.1
286029	190+	7.1
Hosmer silt loam		
286007	0–1	4.5
286008	1–3	4.4
286009	3–8	4.1
286010	8–11	4.3
286011	11–26	4.2
286012	26–30	4.4
286013	30–36	4.0
286014	36–45	4.1
286015	45–64	4.3
286016	64–112	5.2
286017	112–136	6.1
286018	136+	6.1
Zanesville silt loam		
2860234	0–4	5.8
2860235	4–10	5.5
2860236	10–13	4.6
2860237	13–22	4.3
2860238	22–28	4.3
2860239	28–36	4.3
2860240	36–44	4.5
2860241	44–50	4.9
2860242	50–60	5.2
2860243	60–96	5.7
Vanderburgh silt loam		
2860228	0–5	4.7
2860229	5–7	4.5
2860230	7–18	4.3
2860231	18–25	4.4
2860232	25–32	4.5
2860233	32+	4.6
Alford silt loam		
2860212	0–2	5.7
2860213	2–8	4.8
2860214	8–11	4.8
2860215	11–14	4.3
2860216	14–25	4.4
2860217	25–37	4.5
2860218	37–50	4.7
2860219	50–70	5.3
2860220	70–76	6.0
Ayrshire silt loam		
286066	0–1	5.2
286067	1–6	4.9
286068	6–10	4.9
Ayrshire silt loam—Continued.		
286069	10–11	5.3
286070	11–14	5.6
286071	14–18	5.6
286072	18–30	5.9
286073	30–34	6.2
286074	34–45	6.3
286075	45+	8.1
Woodmere silty clay loam		
286001	0–10	6.8
286002	10–18	6.1
286003	18–24	6.6
286004	24–36	3.8
286005	36–48	4.0
286006	48–96	4.0
Weinbach silt loam		
286076	0–2	6.4
286077	2–8	5.1
286078	8–16	4.5
286079	16–28	4.5
286080	28–40	4.6
286081	40–48	4.6
286082	48+	4.8
McGary silt loam:		
286030	0–1	5.5
286031	1–2	4.6
286032	2–4	4.1
286033	4–9	4.3
286034	9–12	4.5
286035	12–20	4.6
286036	20–26	6.6
286037	26–32	6.0
286038	32–40	8.2
286039	40+	8.5
Zipp silty clay loam		
286047	0–8	6.6
286048	8–14	5.8
286049	14–22	5.1
286050	22–54	7.8
286051	54+	7.1
Montgomery silty clay loam		
2860271	0–3	6.6
2860272	3–12	6.0
2860273	12–22	6.3
2860274	22–32	6.5
2860275	32–54	7.2
2860276	54+	7.3
Peoga silt loam		
286052	0–¼	5.1
286053	¼–1	6.4
286054	1–6	5.5
286055	6–8	6.1
286056	8–12	5.2
286057	12–24	4.9
286058	24–45	5.8
286059	45–70	5.8

[1] Determinations made by E. H Bailey, Assistant soil technologist, Bureau of Plant Industry, Soils and Agricultural Engineering

colored soils, streams and artificial drainageways have been cut through the large areas of lake flats in the northern part of the county. Consequently, such areas constitute the flood plains of the present streams and, as such, receive backwater and headwater deposits of river silts. The colluvial phase of Algiers silt loam receives most of its wash from headwaters or as local wash from adjacent hillsides.

Memphis silt loam, colluvial phase, and Keyesport silt loam are derived from local alluvium. They occur at the bases of upland slopes as colluvial-alluvial fans extending outward from the slope toward the bottoms of terraces. Memphis silt loam, colluvial phase,

consists of wash coming principally from the Memphis soils. It is better drained than the Keyesport soil, which consists of local alluvium coming from Hosmer, Zanesville, and Vanderburgh soils.

Table 14 gives the results of mechanical analyses of samples of various soil profiles.

Table 15 gives the results of pH determinations on samples of a number of soil profiles. These determinations were made by the hydrogen-electrode method.

SUMMARY

Vanderburgh County is in the southwestern part of Indiana, where the Ohio River forms its southern boundary. It includes an area of 233 square miles, approximately two-thirds of which is more or less hilly, and the remaining one-third is smooth. The county possesses a large mileage of good roads, most of them leading to Evansville, a large industrial city and the principal market for the agricultural products of the county.

The climate of the county is continental, being hot in summer and moderately cold in winter. The average annual rainfall of 43.16 inches is fairly well distributed throughout the year, although the heaviest rainfall occurs in the spring. The average length of frost-free period is 211 days.

General farming, dairying, and cash-grain farming are the main agricultural enterprises. The type of land, danger from floods, and nearness to market determine to a large extent the use of the land. Corn, wheat, hay, and soybeans are the principal crops. Barley, oats, potatoes, tomatoes, miscellaneous vegetables, apples, peaches, pears, and cherries are also grown. Approximately one-third of the total cropland used for corn, wheat, hay, and soybeans is in corn, one-third in wheat, one-sixth in hay (excluding soybean hay), and one-sixth in soybeans.

The upland soils of the hilly sections are dominantly silt loams and are underlain by sandstones, siltstones, and shales. They occur on slopes ranging from nearly level to steep. The soils on old river terraces and lake-plain flats are silt loams and silty clay loams most of which are imperfectly drained. The soils of the bottoms, except those of the Ohio River, are silt loams and comprise large areas of imperfectly or slowly drained soils. The soils of the Ohio River bottoms are generally heavier in texture, darker in color, and sweeter in reaction than those of other flood plains.

The soils and miscellaneous land types have been grouped as follows on the basis of parent materials: (1) Moderately deep silty soils developed over sandstone, siltstone, and shale, (2) shallow soils over sandstone, siltstone, and shale, (3) deep silty soils of the uplands, (4) soils developed from silts of the lake plains, (5) soils developed from slack-water clays, (6) soils of the Ohio River terraces, (7) alluvial soils, and (8) miscellaneous land types.

Groups 1, 2, and 3 comprise the soils of the uplands. Of these, the Alford, Hosmer, Zanesville, and Memphis silt loams are the well-drained soils of the rolling uplands. They have light grayish-brown surface soils and yellowish-brown or brownish-yellow subsoils.

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These soils are planted to all of the locally grown crops, except where slopes are too steep or where erosion has been too severe. Group 1 includes Hosmer, Zanesville, Tilsit, and Johnsburg silt loams and various slope and erosion phases. Tilsit silt loam occupies gentle slopes and is imperfectly drained, and Johnsburg silt loam occupies level land and is slowly drained and very light colored. The Tilsit and Johnsburg soils in many places have been improved by artificial drainage, but even so they are not so productive as the Iona and Ayrshire silt loams of group 4.

Group 2 consists of Vanderburgh silt loam and its various slope and erosion phases, and rough gullied land (Vanderburgh soil material). These soils occupy slopes in association with Zanesville, Hosmer, and Memphis soils; and most of the land that has been cleared is severely eroded and gullied. The Vanderburgh soils and rough gullied land are suitable only for permanent pasture or forest.

Group 3 includes the Memphis and Alford silt loams and their various slope and erosion phases. Both soils are developed from deep silts; and cultivated sloping areas of both have been more or less eroded. In general, erosion has been more severe on the Memphis soils than on the Alford, and the Alford soils are more productive than the Memphis.

Groups 4, 5, 6, and 7 comprise the largest areas of soils suitable for farming, because the lay of the land is favorable on most of them. These groups embrace some of the most productive soil types of the county.

Group 4 consists of Iona, Ayrshire, Peoga, Ragsdale, and Zipp silt loams and Lyles silty clay loam. These soils are in close geographic association with Alford silt loam in the northwestern part of the county, which is a prosperous farming section devoted to general farming, dairying, and hog raising. Iona silt loam is imperfectly drained and Ayrshire and Peoga silt loams are slowly drained. Both soils are fairly light colored in contrast to the dark-colored poorly drained Ragsdale and Zipp silt loams and Lyles silty clay loam. All of these soils, except Peoga silt loam, are quite productive where they are artificially drained; and the dark-colored members of the group are among the most productive soils of the county where artificial drainage can be maintained. Peoga silt loam has been improved by the addition of lime and fertilizer, and fairly good yields of corn, wheat, and hay are obtained in favorable years.

Soils of Group 5 are developed from calcareous slack-water clays deposited in backwaters of small streams. Markland silt loam and its various eroded and slope phases occur on the breaks near the streams and are not so well suited to agriculture as the McGary, Montgomery, and Zipp soils of the level areas. McGary soil is light colored and requires artificial drainage before cultivation, and it is much less productive than the Montgomery and Zipp soils when these have been drained. These last-named soils are among the most productive soils of the county and are especially well suited to the production of corn and soybeans.

Group 6 includes the soils of the natural terraces of the Ohio River. Soils in these terraces consist of Wheeling silt loam, Wheeling loam, and Wheeling fine sandy loam, and phases of these soils; Woodmere silty clay loam and its phases; Sciotoville silt loam and its phases;

Rahm silty clay loam; Weinbach silt loam; and Ginat silt loam. The Wheeling soils are naturally well drained and respond to good management practices with medium to fairly high yields. The Sciotoville soils are imperfectly drained, and Weinbach and Ginat silt loams are slowly drained. All these soils are light colored, and the last two require artificial drainage before satisfactory yields can be expected. A heavy subsoil in all three reduces the productivity considerably because the soil is too wet during the early part of the growing season and is likely to become too dry during the period when corn is approaching maturity. The Woodmere and Rahm soils occur on a low terrace that is fairly frequently overflowed from the Ohio River.

Alluvial soils occur along the Ohio River and its tributaries throughout the county. These soils comprise group 7. The Ohio River flood plain comprises a large total area of relatively smooth farming land devoted to cash-grain farming. The dominant soils belong to the Huntington, Lindside, and Melvin series and range in texture from fine sandy loam to silty clay. The Huntington soils are well drained, the Lindside imperfectly drained, and the Melvin soils slowly drained. Corn and soybeans are practically the only crops, owing to periodic flooding from the Ohio River. Much corn is produced, and some of the highest acre yields of the county are obtained on these soils. Boehne silt loam, with its very sandy subsoil, and the undifferentiated sandy alluvium are both droughty and not very productive. Acid silty soils of aggraded valleys are members of the Philo, Stendal, and Waverly series. In the order given they are increasingly more slowly drained. The slightly acid and neutral soils of aggraded soils are members of the Adler, Algiers, and Inglefield series. Philo and Adler silt loams resemble each other in color as do Stendal and Inglefield silt loams. These alluvial soils are important in the hilly sections of the county, because they can be used to grow feed crops for dairy and work animals that are pastured on the rougher land. Crops of corn, wheat, and hay are grown with medium to high yields. Overflows occasionally damage the crops, particularly wheat. Keyesport silt loam and Memphis silt loam, colluvial phase, are derived from locally washed soil material. They lie at the bases of upland slopes and extend outward toward the stream bottoms. The Keyesport soil receives wash principally from the Zanesville and Hosmer soils; and Memphis silt loam, colluvial phase, receives most of its wash from the Memphis soils. The Keyesport soil is not so well drained as Memphis silt loam, colluvial phase. These soils are good for cultivated crops.

Miscellaneous land types (group 8) includes made land, borrow pits, and riverwash. With the exception of made land around the edge of Evansville, none of these miscellaneous land types are suitable for growing crops.

Erosion control is a serious problem in the maintenance of fertility on the soils of the uplands. Eroded phases of varying degrees of severity are recognized on all the soils with slopes of 3 percent or steeper.

Use of lime and legumes are recommended practices in the maintenance or increase of productivity for most of the soils of the uplands, except those that are already receiving this treatment.

The best utilization of the idle land of the county, which comprises a relatively large total area, needs consideration. This land should either be converted into good pasture with the use of lime and fertilizer or should be reforested.

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SOIL MAP
VANDERBURGH COUNTY
INDIANA

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James Thorp, Acting Inspector, District 1.
Soil surveyed by A. J. Vessel, Bureau of Plant Industry, in charge, and J. G. Wade, Soil Conservation Service, and Sutton Myers, Purdue University Agricultural Experiment Station.

Scale 2 inches = 1 mile

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Polyconic projection, 1927 North American Datum.
Horizontal control by U. S. G. S., and U. S. C., and G. S.
Culture and drainage in part compiled from aerial photographs.
10000 foot grid based upon Indiana (West) system of plane coordinates.
Surveyed in 1938-39. Series 1939.